



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

TX 511.1 .M659m
Milne, William J.
Mental arithmetic. /

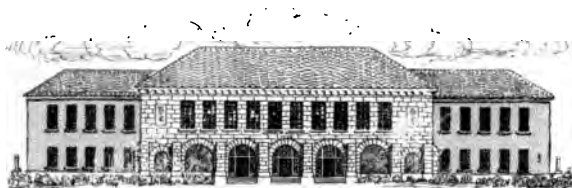
Stanford University Libraries



3 6105 04927 2607

PRESENTED BY THE PUBLISHERS
— TO THE —
TEXT-BOOK COLLECTION
— OF THE —
Department of Education

LELAND STANFORD JUNIOR UNIVERSITY



SCHOOL OF EDUCATION
LIBRARY

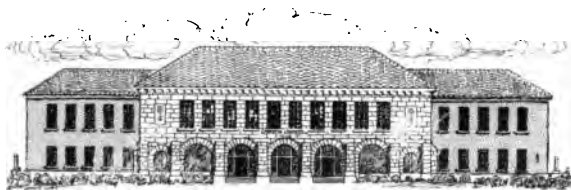
TEXTBOOK COLLECTION
GIFT OF
THE PUBLISHERS



STANFORD UNIVERSITY
LIBRARIES

PRESENTED BY THE PUBLISHERS
—TO THE—
TEXT-BOOK COLLECTION

—OF THE—
Department of Education
LELAND STANFORD JUNIOR UNIVERSITY

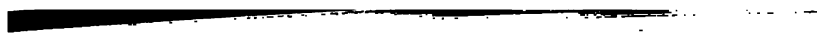


SCHOOL OF EDUCATION
LIBRARY

TEXTBOOK COLLECTION
GIFT OF
THE PUBLISHERS



D UNIVERSITY
LIBRARIES



1. The first part of the document is a list of names and addresses of the members of the committee.

A

MENTAL ARITHMETIC

BY

WILLIAM J. MILNE, PH.D., LL.D.

PRESIDENT OF NEW YORK STATE NORMAL COLLEGE, ALBANY, N.Y.

**DEPARTMENT OF EDUCATION
LELAND STANFORD JUNIOR UNIVERSITY**



**NEW YORK · CINCINNATI · CHICAGO
AMERICAN BOOK COMPANY**

Ju

613423

C

COPYRIGHT, 1897, BY
AMERICAN BOOK COMPANY

MILNE'S MENTAL ARITH.

E-P 10

PREFACE

There are many who believe that Mental Arithmetic is one of the most valuable studies in a school curriculum. There can be no doubt that if the subject is properly taught it develops a habit of concentration of mind, which is one of the most desirable ends to be attained by any scheme of education. This habit is not acquired, however, by constantly performing operations with small numbers or by solving many easy problems which require but little mental effort, but rather by working examples of gradually increasing difficulty, until the pupil is enabled *with effort* to solve problems whose solution might seem to be almost impossible, without resort to ciphering. This habit of concentration, when once it has become established, makes the acquisition of knowledge rapid and delightful, and the development of intellectual power noticeably great.

The plan adopted in this book contemplates not only the attainment of this end, but also another object of equal importance,—the development of the reasoning faculty. The problems are arranged upon a pro-

gressive plan, and the pupil is guided by explanations and suggestions until he is able to devise methods of solution for himself. The book thus follows the method of development which has proved so successful in the author's other works.

It will be seen at once that the book is not a collection of easy problems designed to give the student practice in the simple processes of arithmetic, nor is it an exercise book to accompany a work on written arithmetic. It may be used with profit to supplement such a work, and it gives, also, abundant drill in computing; but it constitutes in itself an independent book, furnishing such a thorough course in arithmetic, that it will give to pupils who master it not only more than common skill in computing, and more than ordinary ability in reasoning, but also a firm grasp of the general principles of the science.

W. J. M.

CONTENTS

	PAGE
ADDITION	7
SUBTRACTION	17
MULTIPLICATION	28
DIVISION	36
FRACTIONS	44
DENOMINATE NUMBERS	109
PERCENTAGE	125
MISCELLANEOUS PROBLEMS	150
TABLES OF DENOMINATE NUMBERS	173



MENTAL ARITHMETIC

ADDITION

1. 1. A boy has 2 cents in one pocket and 1 cent in another pocket. How many cents has he?

2. I see 2 birds on a fence and 2 birds on the ground. How many birds do I see?

3. A boy ate 2 apples and had 3 apples left. How many had he at first?

4. George paid 3 cents for his lunch and had 3 cents left. How much had he at first?

5. I walked 4 miles the first hour, and 3 miles the second. How far did I walk in the two hours?

6. An apple cost 3 cents and an orange 5 cents. How much did both cost?

7. Kate paid 5 cents for some ribbon and 4 cents for candy. How much did she pay for both?

8. Mary had 5 books and bought 5 more. How many had she then?

9. There were 6 lilies on one stalk and 5 on another. How many lilies were there on both stalks?

10. In one room there were 5 windows and in another 7. How many were there in both rooms?

11. A pound of sugar cost 7 cents, and a quart of beans 6 cents. How much did both cost?

12. I bought at one time 8 quarts of berries and at another 7 quarts. How many quarts did I buy?

13. There were 9 fish in an aquarium, and 6 more were put in. How many were there in the aquarium?

14. Arthur had 9 marbles, and Louis 6. How many had both?

15. Maud spelled 9 words and missed 8. How many words were given her to spell?

In the following examples add the given number to each of the succeeding numbers.

16. Add 3

to 8, 5, 4, 6, 8, 2, 9, 7, 6, 8, 5, 4, 3, 8, 5, 7, 6.

17. Add 7

to 3, 7, 4, 3, 9, 4, 8, 6, 9, 2, 6, 8, 5, 7, 4, 3, 9.

18. Add 9

to 6, 3, 5, 7, 6, 8, 9, 3, 2, 5, 8, 4, 7, 6, 8, 4, 5.

19. Add 6

to 5, 3, 8, 4, 7, 8, 5, 6, 8, 4, 2, 9, 8, 7, 4, 5, 6.

20. Add 8

to 5, 8, 2, 7, 9, 6, 3, 5, 8, 4, 6, 3, 9, 8, 7, 6, 5.

21. Add 5

to 8, 3, 9, 4, 7, 6, 3, 8, 2, 5, 9, 7, 6, 4, 3, 2, 8.

22. Add 4

to 6, 8, 5, 3, 6, 7, 9, 2, 4, 8, 5, 3, 6, 8, 4, 2, 6.

23. Add 7

to 5, 9, 3, 7, 6, 8, 4, 5, 4, 9, 3, 4, 7, 8, 6, 1, 8.

24. Add 6
to 8, 3, 2, 9, 5, 8, 3, 6, 7, 8, 3, 9, 7, 4, 2, 9, 5.
25. Add 3
to 7, 6, 5, 4, 9, 3, 8, 6, 2, 7, 9, 3, 4, 5, 8, 2, 7.
26. Add 9
to 6, 3, 7, 8, 5, 9, 2, 8, 6, 3, 5, 4, 3, 8, 6, 5, 3.
27. Add 5
to 7, 8, 4, 3, 6, 8, 7, 9, 6, 3, 7, 2, 8, 6, 5, 4, 9.
28. Add 8
to 4, 3, 8, 6, 7, 5, 3, 2, 8, 6, 4, 8, 5, 9, 3, 7, 6.
29. Add 7
to 5, 4, 7, 6, 3, 8, 4, 9, 5, 7, 2, 8, 5, 9, 3, 1, 6.
30. Add 4
to 9, 5, 4, 3, 9, 7, 6, 8, 4, 3, 9, 7, 5, 6, 1, 8, 2.
31. Add 6
to 6, 5, 8, 7, 9, 6, 8, 5, 9, 7, 4, 3, 2, 8, 2, 7, 9.

2. 1. A pound of rice cost 8 cents and a can of tomatoes 9 cents. Find the cost of both.

2. Charles paid 9 cents for a ball and 10 cents for a bat. How much did they both cost?

3. A paid \$9 on a debt and still owed \$11. How much did he owe at first?

4. A quart of cranberries cost 6 cents and a quart of peaches 12 cents. How much did both cost?

5. Mary answered 8 geography questions and 12 history questions. How many questions did she answer?

6. There were 9 eggs in one nest and 12 in another. How many eggs were there in both?

7. If 12 oranges were bought at one time and 11 at another, how many were bought altogether?

8. A farmer sold 9 calves to one man and 11 to another. How many did he sell to both?

9. George walked 11 miles and rode 10 miles. How far did he go?

10. After paying 7 cents for a top, Henry has 12 cents left. How much had he at first?

11. Milk is 6 cents per quart and cream 12 cents. How much will a quart of each cost?

12. My brother caught a fish weighing 8 pounds, and my cousin another weighing 4 pounds more than the first. How much did both weigh?

13. One number is 9 and another is 3 more than 9. Find their sum.

14. It takes \$5 more to pay my grocer than it does to pay my butcher. If I owe the butcher \$7, how much do I owe both?

15. Henry paid 5 dimes for a pair of skates and 11 dimes for a hat. How much did both cost him?

16. Add to each of the following numbers each of the numbers given in the rows marked (a), (b), (c), etc.:

6, 5, 8, 3, 2, 4, 9, 7, 5, 4, 8, 6, 3.

(a) 3, 5, 6, 8, 2, 9, 5, 6, 8, 4, 5, 6, 7, 3, 9, 2.

(b) 8, 6, 3, 9, 5, 8, 4, 6, 3, 5, 9, 2, 4, 8, 1, 7.

(c) 4, 2, 7, 6, 3, 9, 5, 8, 1, 7, 6, 5, 3, 8, 4, 6.

(d) 5, 8, 3, 9, 4, 2, 7, 3, 9, 5, 8, 7, 6, 2, 5, 4.

(e) 7, 5, 4, 3, 6, 1, 8, 5, 3, 2, 4, 9, 7, 8, 4, 6.

3. 1. What is the sum of 8 and 5? 7 and 8? 9 and 7? 6 and 9? 5 and 7? 9 and 8? 4 and 9?

2. What is the sum of 9 and 5? 9 and 4? 8 and 6? 9 and 9? 8 and 7? 3 and 8?

3. What is the sum of 11 and 9? 7 and 11? 11 and 5? 4 and 11? 11 and 6? 8 and 11?

4. Abram earned 12 cents on Monday and 9 cents on Tuesday. How much did he earn in the two days?

5. I expended 8 cents and 15 cents for two books. How much did I expend for both?

6. How much is 8 and 6? 18 and 6? 28 and 6? 38 and 6? 58 and 6? 88 and 6? 78 and 6?

7. What is the sum of 8 and 9? 18 and 9? 28 and 9? 38 and 9? 88 and 9? 58 and 9? 78 and 9?

8. How much is 3 and 8? 13 and 8? 33 and 8? 53 and 8? 93 and 8? 43 and 8? 73 and 8?

9. My hat cost 63 cents, and my hat band 8 cents. How much did both cost?

10. I paid 75 cents for a ball and 9 cents for a bat. Find the cost of both.

11. How much is 57 and 8? 37 and 8? 17 and 8? 47 and 8? 97 and 8? 67 and 8? 27 and 8?

12. What is the sum of 4 and 8? 44 and 8? 74 and 8? 34 and 8? 14 and 8? 84 and 8?

13. What is the sum of 18 and 8? 28 and 8? 58 and 8? 38 and 8? 88 and 8? 68 and 8?

14. How much is 6 and 9? 9 and 56? 59 and 6? 76 and 9? 89 and 6? 39 and 6? 46 and 9?

15. Add to each of the following numbers, each number given in the rows below them :

4, 5, 8, 7, 3, 2, 9, 6, 5, 8, 4, 7, 9, 10.

(a) 7, 47, 37, 87, 27, 97, 77, 17, 57, 67.

(b) 9, 29, 59, 89, 49, 19, 39, 99, 69, 79.

(c) 6, 66, 56, 86, 36, 76, 46, 26, 96, 16.

(d) 5, 35, 85, 25, 45, 95, 65, 55, 15, 75.

(e) 4, 14, 24, 34, 44, 54, 64, 74, 84, 94.

(f) 8, 58, 18, 48, 28, 38, 78, 98, 68, 88.

(g) 3, 23, 53, 93, 43, 73, 13, 83, 33, 63.

4. 1. What is the sum of 6 and 5 and 9?

2. How many are 9 and 11 and 8?

3. How many are 8 and 8 and 12? 7 and 12 and 10? 6 and 9 and 11? 7 and 6 and 12?

4. What is the sum of 12 and 11 and 8? 11 and 11 and 6? 12 and 5 and 12? 9 and 7 and 9?

5. How many are 5 and 7 and 9 and 6? 8 and 6 and 10 and 5? 6 and 12 and 8 and 7?

6. What is the sum of 28 and 10? 47 and 20? 67 and 30? 25 and 20? 33 and 60?

7. How many are 44 and 20? 23 and 20? 59 and 20? 89 and 40? 54 and 30?

8. How many are 47 and 20 and 9? 39 and 30 and 8? 64 and 20 and 7?

9. What is the sum of 46 and 37?

SOLUTION:—The sum of 46 and 37 is equal to the sum of 46 and 30 and 7. The sum of 46 and 30 is 76; 76 and 7 is 83.

Therefore, the sum of 46 and 37 is 83.

10. How many are 48 and 39? 29 and 36? 67 and 23? 44 and 36? 38 and 46?

11. How many are 77 and 63? 84 and 55? 96 and 78? 99 and 87? 58 and 85?

12. What is the sum of 79 and 28? 86 and 43? 47 and 98? 68 and 87? 74 and 95?

13. How many are 23 and 69? 45 and 46? 37 and 35? 43 and 29? 54 and 39?

14. How many are 37 and 48 and 20? 43 and 66 and 40? 87 and 28 and 10? 65 and 39 and 50?

15. How many are 23 and 44 and 65? 68 and 27 and 39? 46 and 75 and 37? 61 and 75 and 49?

5. 1. A boy paid 5 cents for an orange, 8 cents for a top, and 9 cents for some candy. How much did he pay for all?

SOLUTION: — He paid for all the sum of 5 cents, 8 cents, and 9 cents, which is 22 cents.

2. Harry had 19 cents and earned 9 cents more. How much had he then?

3. In a certain class there are 24 boys and 25 girls. How many pupils are there in the class?

4. In an orchard there are 36 apple trees, 19 pear trees, and 40 peach trees. How many trees are there in the orchard?

5. One boy caught 44 fish, another 37, and a third 30. How many fish were caught by the boys?

6. A man is 46 years old, his wife 38, and their son 12. What is the sum of their ages?

7. I paid 60 cents for some plums, 75 cents for some peaches, and 50 cents for some apricots. How much did they all cost?

8. The distance from Auburn to Glendale is 30 miles, from Glendale to Roseton 18 miles, and from Roseton to Saybrook 20 miles. How far is it from Auburn to Saybrook?

9. England and Wales contain 58 thousand square miles of land, Ireland 33 thousand, and Scotland 30 thousand. What is the combined area?

10. A girl had 3 pieces of ribbon. Their lengths were 27 inches, 49 inches, and 30 inches. How many inches of ribbon had she?

11. One fish weighed 24 pounds, another 36 pounds, and a third 40 pounds. How much did they all weigh?

12. A geography cost 68 cents, an arithmetic 37 cents, and a grammar 30 cents. Find the cost of all.

13. A farm contains 39 acres of woodland and 75 acres of cleared land. How many acres are there in the farm?

14. A miller paid \$65 for wheat, \$39 for rye, and \$40 for oats. How much did all cost?

15. A drover bought at different times 48 horses, 66 horses, 30 horses, and 19 horses. How many horses did he buy?

16. A merchant sold to a customer 3 pieces of cloth. One contained 38 yards, the second 42 yards, and the third 50 yards. How many yards of cloth did he sell?

17. A boy bought 65 Brazil nuts, 83 English walnuts, and 80 almonds. How many nuts did he buy?

18. A horse cost \$85, and a carriage \$25 more than the horse. What was the cost of both?

19. How high is a tree that is 75 feet from the ground to the first limb, and 87 feet from the first limb to the top?

20. From A to B the road extends 37 miles up hill, 29 miles down hill, and 40 miles on a level. How far is it from A to B?

21. A farmer has 87 sheep, 29 cows, and 30 horses. How many animals has he?

22. A miller shipped to a customer at one time 43 barrels of flour, at another time 58 barrels, and made a third shipment of 20 barrels. How many barrels were shipped?

23. A horse cost \$40 more than a cow. How much did both cost if \$48 was paid for the cow?

24. A young man entered the navy when he was 19 years old. That was 23 years ago. How old is he now?

25. I bought a wagon for \$65, I paid \$12 to have it repaired, then sold it so as to gain \$17. How much did I get for it?

26. A merchant deposited in a bank \$25 more on Tuesday than on Monday. If Monday's deposit was \$65, what was the amount of both deposits?

27. Mr. Brown, whose farm consists of 87 acres, buys an adjoining farm that contains 20 acres more than his own farm. How many acres does he have after the purchase?

28. A boy rode a bicycle 28 miles one day and 12 miles farther the second day than the first. How far did he ride during the two days?

29. A silk dress cost \$45, a muff cost \$10 more than the dress, and a cloak cost as much as the dress and muff. Find the cost of all.

30. My horse cost \$125 and my carriage \$75. I sold the horse so as to gain \$40 dollars on the cost of both horse and carriage. How much did I receive for the horse?

31. My father is 11 years older than my mother. They were married 20 years ago, when my mother was 23. What is the sum of their ages now?

32. Arthur weighs 68 pounds, his brother weighs 12 pounds more than he, and their father weighs 20 pounds more than the boys together. Find the sum of all their weights.

33. When I paid bills of 96 cents and 79 cents, I had a quarter of a dollar and two dimes left. How much had I at first?

34. Twenty-five minutes ago it was a quarter to ten. What time will it be one hour and 10 minutes hence?

35. A man traveled 47 miles by rail, 38 miles by stage, and 15 miles on foot. How far did he travel?

36. Harry went to the well for water three times, bringing 14 quarts the first time, 19 quarts the second time, and 17 quarts the third time. How many quarts of water did he bring?

37. After Mr. Allen had sold 75 bushels of wheat to one man and 83 to another he had 36 bushels left. How many bushels did he raise?

38. A farmer sold 27 sheep, lost 16, and had 84 left. How many had he at first?

SUBTRACTION

6. 1. Howard had 8 marbles and lost 3 of them. How many had he left?

2. A boy who had 12 cents paid 5 cents for an orange. How many cents had he left?

3. If 11 birds alighted on a tree, and 4 of them flew away, how many were left on the tree?

4. John is 13 years old, and his brother is 5 years younger. How old is his brother?

5. Mary had a piece of ribbon 15 inches long and gave her sister a piece of it 8 inches long. How many inches of ribbon had she left?

6. The sum of two numbers is 14. If one of them is 6, what is the other?

7. Harry is now 16 years old. How old was he 7 years ago?

8. By selling a bat for 17 cents, Harry gained 8 cents. How much did it cost him?

9. A merchant has 16 barrels of flour, and sells all but 8 of them. How many does he sell?

10. Eggs bought for 10 cents a dozen are sold for 18 cents a dozen. How much is gained on a dozen?

11. Louis lost some marbles and has 9 left. If he had 17 at first, how many did he lose?

12. A man owed his grocer \$15 and paid \$7 of the debt. How much had he yet to pay?

13. To a man whom I owed \$16, I gave a ton of hay worth \$9 and the rest in money. How much money did I pay him?

14. What number must be added to 5 to make 13?

15. A string 15 feet long was cut into two pieces, one of which was 9 feet long. How long was the other piece?

16. A merchant cut 9 yards of ribbon from a piece containing 21 yards. How many yards were left?

17. What sum of money must be added to \$7 to make \$19?

18. James has \$8. How much more must he have to buy a suit of clothes worth \$21?

19. A boy raised 11 bushels of pop corn, and sold 7 bushels. How many bushels had he left?

20. A lady paid \$15 for a cloak, and \$9 less for a hat. How much did her hat cost?

21. If a boy earns \$15 per month, and spends \$7, how much does he save?

22. A man earns \$18 per week, which is \$9 more than his son earns. How much does his son earn?

23. A man gained \$3 on a cow which he sold for \$21. How much did the cow cost him?

24. A watch that cost \$18 was sold at a loss of \$5. How much was received for it?

25. A man whose weekly wages were \$20, spent \$8 every week. How much of his wages had he left at the end of each week?

SUBTRACTION

19

26. From 11, 10, 12, 15, 8, 6, 9, 7, 5, 12, 8, 9, 4, 13,
subtract 3.
27. From 13, 18, 15, 9, 19, 20, 18, 14, 16, 17, 11, 9,
subtract 7.
28. From 20, 13, 18, 10, 15, 19, 21, 16, 12, 14, 17, 15,
subtract 9.
29. From 12, 15, 17, 13, 9, 8, 19, 20, 16, 14, 15, 7, 11,
subtract 6.
30. From 15, 12, 13, 19, 17, 11, 20, 9, 14, 18, 16, 11,
subtract 8.
31. From 13, 15, 8, 12, 18, 17, 20, 11, 9, 14, 19, 16,
subtract 5.
32. From 8, 13, 17, 18, 20, 15, 11, 10, 9, 16, 8, 12, 7,
subtract 4.
33. From 12, 17, 9, 11, 15, 18, 20, 13, 16, 19, 14, 8,
subtract 7.
34. From 15, 12, 10, 8, 11, 9, 13, 17, 19, 20, 16, 14,
subtract 6.
35. From 15, 9, 13, 8, 11, 14, 10, 12, 16, 17, 20, 6, 7,
subtract 3.
36. From 18, 15, 13, 17, 11, 14, 16, 21, 12, 20, 17, 19,
subtract 9.
37. From 8, 12, 15, 19, 11, 14, 9, 7, 10, 13, 16, 20, 18,
subtract 5.
38. From 11, 17, 13, 10, 15, 18, 21, 19, 12, 16, 14, 20,
subtract 8.
39. From 15, 11, 13, 8, 12, 17, 14, 10, 19, 20, 18, 9,
subtract 7.
40. From 10, 13, 17, 11, 9, 19, 12, 18, 16, 15, 8, 14,
subtract 4.

7. 1. How much is 17 less 10? 37 less 10? 27 less 10? 67 less 10? 47 less 10?

2. What is the difference between 28 and 20? 48 and 20? 58 and 30? 48 and 30?

3. How many are left when 20 is taken from 36? 30 from 54? 40 from 85? 60 from 97?

4. Take 29 from 47.

SOLUTION:—29 is equal to 20 plus 9. 20 taken from 47 leaves 27; 9 taken from 27 leaves 18. Therefore $47 - 29 = 18$.

5. Take 31 from 56; 18 from 39; 41 from 86; 16 from 33; 28 from 53.

6. What is the difference between 45 and 90? 47 and 80? 33 and 67? 44 and 71?

7. How much is 93 less 65? 81 less 37? 64 less 29? 75 less 36?

8. Subtract 62 from 100; 39 from 100; 86 from 200; 75 from 150; 89 from 160.

9. Subtract 77 from 120; 59 from 130; 67 from 140; 53 from 160; 38 from 110.

10. Subtract 48 from 123; 55 from 121; 81 from 164; 64 from 165; 91 from 146.

11. Subtract 43 from 121; 68 from 132; 52 from 141; 19 from 101; 18 from 103.

12. Subtract 121 from 187; 135 from 196; 146 from 172; 154 from 193; 119 from 187.

13. Take 230 from 430; 138 from 438; 160 from 470; 290 from 400; 295 from 500.

14. Take 240 from 457; 360 from 477; 570 from 896; 440 from 687; 325 from 575.

8. 1. A farmer has 23 turkeys and sells 14 of them. How many has he left?

2. There are 28 pupils in a class room. How many boys are there, if 13 of the pupils are girls?

3. I paid \$21 for a ton of hay and 2 cords of wood. The wood cost \$8. How much was paid for the hay?

4. A boy caught 45 fish, but 16 of them were so small that he threw them back into the water. How many had he left?

5. Mr. Brown borrowed \$50. How much did he owe after paying \$23 of the debt?

6. A tailor has a piece of cloth containing 43 yards. After he has used 18 yards, how much is left?

7. A boy has 17 marbles and gets enough more to make 36. How many does he get?

8. A bushel of wheat cost 65 cents, and a bushel of rye 48 cents. How much more did the wheat cost than the rye?

9. From New York to Philadelphia is 90 miles. How much of the distance remains to be traveled after 48 miles of it has been gone over?

10. In an orchard containing 119 trees, 68 are apple trees. If the rest are pear trees, how many pear trees are there?

11. At noon the temperature stood at 88 degrees, and at midnight at 69 degrees. How many degrees had it fallen?

12. By the Fahrenheit scale the boiling point of water is 212 degrees, and the freezing point 32 degrees. What is the difference between the two points?

13. A boy who has 50 cents spends 15 cents and earns 25 cents. How much has he then?

14. A cistern containing 100 gallons of water discharges 35 gallons by one pipe, and receives 85 gallons by another. How much water remains in the cistern?

15. Mr. Davis will be 50 years old in 8 years. How old was he 7 years ago?

16. Three boys had together 100 marbles. The first had 25, the second 35. How many had the third?

17. A fish was 40 inches long. The length of the head was 8 inches, and of the tail 9 inches. How long was the body?

18. A farmer had 87 sheep in a pasture, and 30 of them escaped. He succeeded in returning 23 of them to the pasture. How many had he then?

19. Louis earned two dollars. He bought a hat for 65 cents, and a pair of overshoes for 45 cents. How much money had he left?

20. A merchant has a hat marked \$1.39; he lowers the price 45 cents and then gains 17 cents. How much did it cost him?

21. A lady went shopping with a hundred-dollar bill. She bought a dress for \$22, a hat for \$9, and a cloak for \$31. How much had she left?

22. On Monday I traveled 45 miles north, on Tuesday 23 miles south, and on Wednesday 36 miles north. How far was I then from the place of starting?

23. A boy bought a bicycle for \$65. After expending \$11 for repairs he sold it for \$50. How much did the use of it cost him?

24. A merchant paid \$68 for some goods, \$8 for cartage, and \$5 for storage. He sold the goods for \$100. How much did he gain?

25. I bought a horse for \$90, paid \$25 for keeping him, and sold him for \$160. What was my gain?

26. The sum of the ages of A, B, and C is 135 years. A is 35, and B is 9 years older. How old is C?

27. A jeweler bought a diamond for \$85. He paid \$9 to have it set, and then sold it for \$140. How much did he gain?

28. A drover bought at one time 38 sheep and at another time 65 sheep; he sold 44 of them. How many were left?

29. A boy gathered 89 quarts of nuts. He gave away 15 quarts, kept 28 quarts, and sold the rest. How many quarts did he sell?

9. 1. How many are $8 + 17 - 9$? $12 - 5 + 8$? $13 - 9 + 12$? $16 + 12 - 10$? $14 + 9 - 12$?

2. What is the value of $8 + 13 - 9$? $14 - 7 + 6$? $32 - 20 + 9$? $50 - 25 + 6$? $18 + 17 - 20$?

3. What is the value of $23 + 18 - 20$? $17 - 11 + 27$? $41 - 19 - 9$? $16 + 18 - 14$? $11 + 17 - 13$?

4. How many are $8 + 9 + 20 - 14$? $12 + 5 - 3 - 6$? $13 + 14 - 9 - 6$? $24 + 16 - 30$? $36 + 25 - 31$?

5. Find the value of: $17 - 9 + 23$; $19 + 17 - 20$; $14 + 17 - 12$; $16 + 41 - 17$; $23 + 18 - 21$.

6. Find the difference between 100 and $24 + 38$.

7. How many are $12 + 9 + 7 - 6 + 4$? $18 + 17 - 14 - 8$? $23 + 25 - 20 - 18$?

8. How many are $25 + 75 - 36 - 24$? $35 + 65 - 25 + 20$? $30 + 18 - 12 - 24$?

9. What is the value of $23 + 27 - 18 - 15$? $44 + 22 - 33 - 11$? $27 + 33 - 15 + 8$?

10. A boy had 45 marbles. He lost 17 of them and then bought 25. How many did he then have?

11. From a tub containing 46 pounds of butter, 13 pounds were sold to one customer and 17 to another. How much remained unsold?

12. In one field there are 44 sheep; in a second field there are 37; in a third field there are enough to make the entire number 150. How many are there in the third field?

13. From A to B the distance is 100 miles. A man sets out from A and travels 65 miles of this distance and then returns 17 miles along the same road. How far is he from B?

14. A man who owes \$78 pays at one time \$25 and at another time \$18. How much does he still owe?

15. John has \$37, Henry has \$15 more than John, and Arthur has a sum such that the three together have \$130. How much has Arthur?

16. How much change should I get from \$2 after paying 38 cents for ribbon, 50 cents for a cap, and 65 cents for a pair of gloves?

17. A man who has \$45 in his purse draws his monthly pay of \$135. After paying his grocer \$28, and other bills amounting to \$72, how much is left?

18. A person who has \$67 in a bank deposits \$99 more, then draws out \$75. How much has he then in the bank?

19. A rope 100 feet long was cut into three pieces. One piece was 42 feet long, and another was 18 feet shorter. How long was the third piece?

20. A lady gave a merchant a fifty-dollar bill and two twenty-dollar bills. This money exactly paid for a dress costing \$22, a cloak costing \$17 more than the dress, and a shawl. How much did the shawl cost?

21. Howard gathered 57 quarts of nuts, Edwin gathered 13 quarts more than Howard, and William 13 quarts less than Howard. How many quarts did they all gather?

22. From a school registering 95 boys and 108 girls, there were absent 17 boys and 23 girls. How many pupils were present?

23. A man left home and traveled the first day 38 miles and the second day 43 miles. He then set out to return, traveling the first day 26 miles. How far had he yet to go?

24. A man of war's crew consisted of 300 men. In an engagement 45 were killed, and the wounded were 35 more than the killed. How many were unhurt?

25. By selling some goods for \$120 a merchant gained \$37. How much should he have received for the goods to have gained \$19?

26. A boy has some money and earns 48 cents more. He then buys a book for 38 cents and a hat for 62 cents, and has 10 cents left. How much had he at first?

27. From A to B is 150 miles. Of this distance 65 miles is up grade, and the distance down grade is 25 miles less. How much of the distance is level?

28. A farmer has two horses for sale. One man offers him \$95 for one and \$135 for the other. Another offers him \$105 for one and \$110 for the other. Which is the better offer, and how much?

29. A drover bought 47 cows, and then sold to one person 29, and to another 68, and had none left. How many had he at first?

30. A man sold 35 sheep, then bought 14, and then had 25. How many had he at first?

31. A man received \$47 for wages. He paid \$16 for a suit of clothes, \$5 for a barrel of flour, and \$6 for a ton of coal. How much had he left?

32. A merchant paid \$49 for a quantity of goods and \$4 for freight and cartage. For how much did he sell them if he lost \$15?

33. If a lady buys thread for 15 cents, needles for 5 cents, and ribbon for 36 cents, and gives the clerk 75 cents, how much change should he return?

34. A boy having 78 cents gave 19 cents to his brother, 7 cents less to his sister, and lost 4 cents. How much had he left?

35. From a bin containing 97 bushels of wheat 29 bushels were taken for seed and 17 bushels were sold. How many bushels remained in the bin?

36. Roy wishes to buy a ball for 75 cents and a bat for 40 cents. He saves 58 cents, and his mother gives him 25 cents. How much more does he need?

SUBTRACTION**27**

Find the value of:

37. $25 + 18 + 37 - 20 - 5 - 10 + 6 - 7 + 13 - 8 - 4.$
38. $46 + 14 - 30 + 17 - 20 + 6 - 3 + 10 - 15 + 5 - 9.$
39. $81 - 30 - 21 + 45 - 15 + 4 - 20 + 8 - 10 + 7 - 12.$
40. $35 + 18 - 23 + 24 - 16 + 3 + 15 - 10 + 7 + 12 - 5.$
41. $17 + 38 + 5 - 18 + 22 + 7 - 20 + 8 - 15 + 7 - 11.$
42. $25 - 15 + 23 + 7 - 18 + 2 + 25 - 18 - 10 + 6 - 8.$
43. $27 + 23 - 10 + 18 - 12 + 8 - 4 + 20 - 35 + 8 - 10.$
44. $36 - 16 + 20 + 35 - 25 - 15 + 10 + 12 + 7 - 10 - 25.$
45. $41 - 11 + 15 + 15 - 30 + 25 - 40 + 5 + 15 - 10 - 5.$
46. $57 + 13 - 35 + 10 - 9 - 8 + 12 + 15 - 6 - 7 + 8.$
47. $62 + 13 - 25 + 22 - 36 + 4 + 10 + 25 - 20 - 5 + 8.$
48. $18 + 42 - 20 - 25 + 23 - 13 + 24 + 16 - 30 - 8 + 9.$
49. $34 + 16 + 25 - 35 - 15 + 25 - 16 + 18 - 24 + 8 + 12.$
50. $27 - 7 + 20 - 8 + 18 - 10 + 24 + 16 - 20 + 18 - 4.$
51. $53 - 13 + 25 - 17 + 26 - 34 + 57 - 8 + 13 + 4 - 9.$
52. $62 - 32 + 42 - 55 + 23 - 10 + 28 + 15 - 3 - 19 - 7.$
53. $71 + 19 - 40 + 38 - 16 - 24 + 25 - 18 + 6 - 13 - 8.$
54. $83 + 17 - 35 + 10 - 15 - 8 - 20 + 32 - 6 + 18 - 9.$
55. $94 - 28 + 24 - 25 - 14 + 25 - 16 + 8 - 18 + 9 + 18.$
56. $65 + 15 - 40 + 28 - 24 + 13 - 9 + 8 - 12 + 16 - 9.$
57. $85 - 25 + 24 - 18 + 13 - 27 + 18 + 9 - 8 + 6 - 19.$
58. $58 + 22 - 28 + 13 - 16 + 28 + 22 - 31 + 9 + 8 + 6.$
59. $86 + 15 - 21 + 18 + 15 - 32 + 16 - 8 + 11 + 6 - 18.$
60. $87 - 24 + 13 - 18 + 8 + 6 - 31 - 17 + 10 - 4 - 7.$
61. $28 + 32 - 17 + 41 + 6 - 12 - 5 + 14 + 13 - 16 - 11.$
62. $91 - 30 + 16 - 45 + 8 + 13 - 19 + 17 - 15 + 3 + 9.$

MULTIPLICATION

10. 1. At 2 cents each, what is the cost of 3 apples?
2. How far does a man walk in 4 hours, at the rate of 3 miles per hour?
3. How much will 3 oranges cost, at 5 cents each?
4. Each side of a square is 4 rods long. How far is it around the square?
5. If I burn 3 tons of coal per month, how much will I burn in 6 months?
6. Henry's steps are each 3 feet in length. How far does he go in 8 steps?
7. At 5 cents each, how much must be paid for 7 oranges?
8. How many days are there in 4 weeks?
9. A man gave 10 cents to each of 5 children. How much did he give to all?
10. In one yard there are 3 feet. How many feet are there in 12 yards?
11. A horse eats 7 quarts of oats in a day. How much does he eat per week?
12. A man earns \$8 a day. How much does he earn in 6 days?
13. At 6 cents a yard, how much will 5 yards of ribbon cost?

14. There are 8 quarts in a peck. How many quarts are there in 4 pecks?

15. At 9 cents a pound, what will be the cost of a fish weighing 3 pounds?

16. If 5 men can do a piece of work in 4 days, in what time can one man do it?

17. Multiply 3, 8, 7, 6, 5, 9, 8, 7, 6, 8, 2, 4, 5, 9, 6, 8, 3, 4, 10, 11, 12,

by 2; by 4; by 6; by 8; by 7; by 10.

18. Multiply 5, 4, 7, 6, 9, 10, 8, 3, 5, 7, 6, 9, 2, 5, 8, 3, 11, 9, 12,

by 3; by 5; by 7; by 10; by 4; by 8.

19. Multiply 6, 5, 8, 9, 7, 5, 4, 3, 8, 7, 9, 10, 12, 6, 8, 9, 11, 2, 5,

by 4; by 3; by 5; by 7; by 6; by 12.

20. Multiply 8, 7, 5, 6, 12, 4, 9, 10, 4, 6, 8, 7, 11, 10, 9, 8, 2, 3, 5,

by 5; by 4; by 6; by 8; by 3; by 11.

21. Multiply 7, 8, 9, 5, 4, 8, 3, 4, 6, 5, 10, 3, 8, 2, 6, 4, 9, 11, 12,

by 6; by 5; by 7; by 9; by 4; by 3.

22. Multiply 5, 4, 3, 2, 5, 9, 7, 8, 6, 7, 6, 8, 9, 10, 5, 4, 11, 12, 7,

by 7; by 4; by 3; by 8; by 9; by 10.

23. Multiply 4, 3, 5, 8, 6, 7, 9, 8, 2, 5, 10, 9, 3, 7, 6, 5, 12, 11, 9,

by 8; by 2; by 3; by 7; by 4; by 6.

24. Multiply 12, 7, 6, 8, 5, 4, 9, 8, 7, 6, 5, 9, 3, 10, 11, 8, 9, 6, 5,

by 9; by 3; by 6; by 5; by 7; by 12.

11. 1. At 20 cents a yard, how much will 7 yards of ribbon cost?

SOLUTION:—Since 1 yard of ribbon costs 20 cents, 7 yards will cost 7 times 20 cents or 140 cents. Therefore 7 yards will cost 140 cents.

2. At the rate of 30 miles per hour, how far will a train go in 8 hours?

3. A man smokes 2 cigars per day at 10 cents each. How much will his cigars cost in 30 days?

4. My watch cost 10 times as much as my coat, for which I paid \$20. How much did my watch cost?

5. If a mechanic earns \$3 per day, how much does he earn in 30 days?

6. At the rate of 12 miles per hour, how far can a steamer go in 40 hours?

7. How much must be paid for 8 pounds of coffee, at 30 cents per pound?

8. If 9 men can do a piece of work in 40 days, how long will it take one man to do it?

9. A cubic foot of lead weighs 11 thousand ounces. How many thousand ounces do 12 cubic feet of lead weigh?

10. A man worked 9 months at \$80 per month. How much should he receive?

11. If I can save \$20 per month, how much can I save in a year?

12. A drover sold 80 cattle at \$60 each. How much did he get for them?

13. What will be the cost of 8 horses at \$120 each?

14. A man works 10 hours per day for 30 days. How many hours does he work?

15. There are 60 minutes in one hour. How many minutes are there in 9 hours?

16. At 90 cents per bushel, how much will 120 bushels of potatoes cost?

17. At 8 cents a quart, how much will 20 quarts of berries cost?

18. How many horses will consume as many bushels of oats in one day as 7 horses will consume in 11 days?

19. If a boy can ride a bicycle 10 miles in one hour, how far can he ride in 16 hours?

20. There are 12 inches in one foot. How many inches are there in 9 feet?

21. What will be the cost of 30 pounds of beef, if one pound costs 11 cents?

22. In an orchard there are 11 trees in a row and 9 rows. How many trees are there in the orchard?

23. James has 25 postage stamps and John has 5 times as many. How many has John?

24. A newsboy sold 25 papers at 3 cents each. How much did he receive for them?

25. A boy works 7 examples a day. How many does he work in 80 days?

26. How many ounces of candy are there in 8 boxes, each containing 2 pounds and a half, or 40 ounces?

27. If 9 firecrackers are sold for one cent, how many can a boy get for 30 cents?

28. How much money will a street-car conductor collect from 25 passengers, if the fare is 5 cents?

12 1. How much must be paid for two boxes of oranges, each containing 200 oranges, at 2 cents each?

2. How much can a man earn in 30 days, working 9 hours a day, at 20 cents an hour?

3. How much is 3 times 8 times 5? 9 times 6 times 10? 4 times 5 times 6? 5 times 12 times 6?

4. How much is 7 times 8 times 10? 4 times 12 times 10? 20 times 30 times 10? 30 times 40 times 20?

5. I bought 5 bags of coffee, each containing 60 pounds, at 20 cents a pound. How much did the coffee cost?

6. How much will the glass for 12 windows cost at 10 cents a pane, if there are 8 panes in each window?

7. How much will 120 square yards of plastering cost at 30 cents a square yard?

8. Two mahogany boards, each containing 28 square feet, are sold for 10 cents a square foot. How much is received for them?

9. How much will be received for 9 barrels of sirup, each containing 40 gallons, if it is retailed at 50 cents a gallon?

10. I bought 20 dozen pairs of shoes at \$2 a pair. How much did they all cost?

11. A dairyman has 60 cows that give a daily average of 12 quarts of milk each. He sells the milk at 6 cents a quart. How much does he get for it in 10 days?

12. In 720 revolutions of a 28-inch wheel, a bicycle goes a mile. How many revolutions will it make in going 20 miles?

13. How much will it cost to put down 600 square feet of sidewalk at 30 cents per square foot?

14. How much will 25 chickens cost at 50 cents apiece?

15. How much will 20 tons of hay cost at \$17 per ton?

16. How much will 30 cows cost at \$29 per head?

13. 1. What will be the cost of 5 oranges at 3 cents apiece and 6 apples at 2 cents apiece?

SOLUTION:— They will cost the sum of 5 times 3 cents and 6 times 2 cents. 5 times 3 cents are 15 cents, and 6 times 2 cents are 12 cents; 15 cents and 12 cents are 27 cents. Therefore, etc.

2. Find the cost of 5 pounds of sugar at 6 cents a pound, and 3 quarts of berries at 8 cents a quart.

3. How much must be paid for 3 pounds of rice at 6 cents a pound, and 4 quarts of beans at 8 cents a quart?

4. I bought 2 loaves of bread at 8 cents a loaf, and 4 quarts of milk at 7 cents a quart. How much did they cost?

5. A man rides 5 hours in a carriage at the rate of 9 miles an hour, and walks 8 hours at the rate of 3 miles an hour. How far does he go?

6. How much change should I receive out of 50 cents after paying for 4 pounds of beef at 9 cents a pound, and two cabbages at 6 cents per head?

7. A man has 80 miles to go, and drives 8 hours at 7 miles per hour. How far has he yet to go?

8. At 2 cents apiece, how much will 5 dozen eggs cost?

9. At \$6 a ton, what will be the cost of enough coal to last 8 months, if 2 tons last one month?

10. What will be the cost of 8 yards of ribbon at 9 cents a yard, and 4 yards of calico at 7 cents a yard?

11. John earns \$15 per week and pays \$6 per week for his board. How much does he save in 20 weeks?

12. A and B travel in opposite directions from the same point, at the rate of 6 miles and 9 miles per hour respectively. How far apart will they be in 8 hours?

13. Two brothers who receive \$20 per week each, expend weekly \$12 and \$9 respectively. How much do they together save in 10 weeks?

14. A three-story house has two flights of stairs of 15 and 14 steps respectively. How many steps must a person take in going up and down 5 times?

15. A music teacher gives 8 lessons per day at \$2 per lesson. How much does he earn in 6 days?

16. A farmer takes to a mill 9 loads of wheat of 40 bushels each, and 4 loads of 50 bushels each. How much is it worth at \$1 per bushel?

14. 1. What is the cost of 5 tons of hay at \$18 a ton?

2. A man traveled 34 miles per day for 5 days, and had 30 miles still to travel. What was the length of the journey?

3. How much must be paid for 2 dozen shirts at 75 cents apiece?

4. A grocer sold 30 pounds of dried beef at 18 cents a pound. How much did he get for it?

5. What is the cost of 9 cows at \$37 each?
6. How many words are there on a page of 32 lines that average 12 words to a line?
7. How many times 15 are 8 times 15 and 4 times 15?
8. I bought at one time 12 pounds of meat at 20 cents a pound and at another time 18 pounds at the same price. How much did both quantities cost?
9. At 18 cents per pound, how much more must be paid for 21 pounds of butter than for 12 pounds?
10. Find the sum of 13 times 48 and 17 times 48.

SUGGESTION: — 13 times 48 added to 17 times 48 equals 30 times 48.

11. A man drives for three days at the rate of 8 miles per hour. The first day he drives 7 hours, the second 11, and the third 12. How far does he drive in all?
12. From one hive a man got 35 pounds of honey, and from another 45 pounds. He sold it all at 25 cents a pound. How much did he get for it?
13. One cask contains 98 gallons of vinegar, and another 53 gallons. It is sold for 60 cents a gallon. How much more is received for the first cask than for the second?
14. How much water will supply a house for one week, if 250 gallons are used daily?
15. A woman sold to a grocer 5 dozen eggs at one time and 7 dozen at another, at 25 cents a dozen. She received in payment 6 pounds of tea worth 40 cents a pound. How much was still due her?

DIVISION

15. 1. How many oranges at 3 cents each can be bought for 24 cents ?

SOLUTION:— Since the oranges cost 3 cents apiece, as many can be bought for 24 cents as 3 cents are contained times in 24 cents, or 8 oranges.

Therefore, at 3 cents apiece, 8 oranges can be bought for 24 cents.

2. At 5 cents a pound, how many pounds of sugar can be bought for 25 cents ?

3. If 28 cents are divided equally among 4 boys, how much will each receive ?

SOLUTION:— Since the money is to be divided equally among 4 boys, each will receive one of the four equal parts of it, or one fourth of it. One fourth of 28 cents is 7 cents.

Therefore if 28 cents are divided equally among 4 boys, each boy will receive 7 cents.

4. If 5 men consume 35 ounces of bread per day, how much is that for each man ?

5. When coal is \$4 per ton, how many tons can be bought for \$36 ?

6. A dealer bought flour for \$72, at \$8 per barrel. How many barrels were purchased ?

7. If 45 acres are divided into 9 equal lots, how many acres are there in each lot ?

8. If \$63 is paid for 7 tons of hay, what is the price per ton?

9. In 8 hours a man rode 72 miles on a bicycle. What was his rate per hour?

10. How many pounds of meat at 12 cents a pound can be bought for \$1.20?

11. Divide 54 nuts equally among 6 boys. How many does each receive?

12. If 12 pounds of rice cost 84 cents, how much did it cost per pound?

13. In 9 feet there are 108 inches; how many inches are there in 1 foot?

14. A man drives 64 miles in 8 hours. What is his rate per hour?

15. At 12 cents a dozen, how many dozen eggs can be bought for \$1.32?

16. A drover sold 6 sheep for \$42. How much did they bring per head?

17. Mary paid 45 cents for some ribbon at 9 cents per yard. How many yards did she buy?

16. 1. If 3 books cost \$1.20, how much do they cost apiece?

2. I paid \$4 for 20 pounds of butter. How much did I pay per pound?

3. When \$3.20 will pay for 80 pounds of brown sugar, how much is it per pound?

4. How much are oranges apiece, when 50 cost \$2.50?

5. A grocer paid \$6 for 30 dozen eggs. How much did they cost him per dozen?

SUGGESTION:—\$6 is equal to 600 cents.

6. A farm of 200 acres is bought for \$6000. What is the price per acre?

7. If 40 horses cost \$8000, what was the average cost per head?

8. If the weight of 20 sacks of coal is 4000 pounds, how much does one sack weigh?

9. If 10 tons of hay cost \$98, what is the cost of one ton?

10. At 8 cents a pound, how many pounds of rice can be bought for \$16?

11. If 8 men earn \$96 in 4 days, how much does each man earn per day?

SUGGESTION:—Each man earns \$12 in 4 days.

12. If 2 eggs are bought for 5 cents, how many can be bought for \$1?

SUGGESTION:—As many times 2 eggs as 5 cents is contained times in \$1.

13. In 12 class rooms there are 600 desks. If each room contains the same number, how many are there in each room?

14. When coal is \$5.50 a ton, how many tons can be bought for \$550?

15. How many yards of muslin at 5 cents a yard can be bought for \$8?

16. How much were shoes a pair when 40 pairs cost \$100?

17. At 30 cents per pound, how many pounds of coffee can be bought for \$15?

17. 1. Mary buys 9 yards of ribbon at 12 cents a yard and receives 17 cents change. How much money does she give the merchant?

2. When pears were 8 cents each, a boy gave 75 cents for 5 pears and 7 peaches. How much did he pay apiece for the peaches?

3. If 8 quarts of berries worth 10 cents a quart are exchanged for 5 yards of ribbon and 15 cents in money, how much is the ribbon worth per yard?

4. If 4 chickens at 30 cents each, and 5 ducks cost together \$3, how much do the ducks cost apiece?

5. A and B had each 50 acres of land. After A had sold B 23 acres and A had bought back 31 acres, how many acres had each?

6. A cistern holding 500 gallons is full. After two pipes have been open 8 hours, one of which carries away 200 gallons an hour, and the other brings in 150 gallons an hour, how much remains in the cistern?

7. If 20 bushels of wheat will make 5 barrels of flour worth \$8 a barrel, what is the value of one bushel of wheat?

8. A man bought 24 sheep for \$60 and sold them so as to gain \$36. How much did he get for them per head?

9. A grocer buys a kit of mackerel for \$5. If there are 50 mackerel in the kit, and he sells them at the rate of 2 for 25 cents, what is his gain?

10. If 5 bushels of oats cost as much as 4 bushels of rye, and 4 bushels of rye are worth 3 bushels of wheat, how much must be paid for oats when wheat is \$1 a bushel?

11. I buy chickens at the rate of 8 for \$3 and sell them at the rate of 8 for \$5. If my gain is \$100, how many do I sell?

12. Four men agree to build a wall in 8 days for \$120. After they have worked 4 days, two other men are engaged. How much should each receive if the work is finished in the time?

13. A grocer makes a mixture of 5 pounds of tea worth 40 cents a pound, and 3 pounds worth 60 cents a pound and sells it all so as to gain \$1. How much does he get for it per pound?

14. A baker buys 20 tons of coal in three months. How much does he pay for coal in a year, if it costs \$6 per ton?

15. How many men will be required to do as much work in 3 days as 7 men can do in 9 days?

16. What will be the cost of 11 yards of ribbon, if 4 yards cost \$1?

17. A girl expended \$3 for dress goods, at the rate of 2 yards for 75 cents. How many yards did she buy?

SUGGESTION:— She bought as many times 2 yards as 75 cents is contained times in \$3.

18. How many pounds of beef at 18 cents a pound should be exchanged for 9 dozen eggs at 14 cents a dozen?

19. A quantity of provisions will last 9 men 18 days. How long will it last 6 men?

20. If 50 yards of cloth at 90 cents a yard are exchanged for flour at \$5 per barrel, how many barrels will be received?

21. If a man can drive 37 miles in 5 hours, how far can he drive in 25 hours?

22. If the current of a river runs 3 miles per hour, how far can a man go in 10 hours down and 10 hours up stream, his rate of rowing in still water being 6 miles per hour?

SUGGESTION:—The current aids him 3 miles per hour going down stream and retards his progress 3 miles per hour in going up.

23. I sold 5 houses at \$300 each, and invested the money in lots at \$50 each. How many lots did I buy?

24. A had 20 sheep; B had twice as many. They were all sold for \$300. What was the selling price per head?

25. I bought some hay for \$100. After using 2 tons I sold the remainder at \$15 a ton, and received \$20 more than I paid for all of it. How many tons did I buy?

26. A man sold a house for \$9000. He invested the proceeds in lots at \$200 each and sold them at \$250 each. How much did he gain?

27. A dairyman buys milk at 5 cents a quart and sells it at 8 cents a quart. His profits are \$36 per week. How much does he sell per week?

28. A and B travel 3 miles and 5 miles per hour respectively. At the end of a certain time they are 240 miles apart. How long has each traveled, if they started at the same time from the same point and went in opposite directions?

29. If 7 sheep are worth \$29, how many sheep are worth \$580?

SUGGESTION:—\$580 is 20 times \$29, therefore the number of sheep is 20 times 7.

30. How many apples can be bought for 69 cents if 11 apples cost 23 cents?

31. If 3 pounds of fish cost the same amount as 2 pounds of beef, how much must be paid for 5 pounds of beef when fish is 12 cents a pound?

32. John can earn as much in 3 days as his sister can in 5 days. How much should John get per day when his sister is paid 75 cents per day?

33. A man gave 50 cents and his wages for 3 days for a pair of shoes at \$2.75 and 5 yards of cloth at 75 cents per yard. What were his wages per day?

34. Two hogs weigh together 480 pounds, and one of them weighs twice as much as the other. What does each weigh?

SUGGESTION:—Three times the weight of the smaller is 480 pounds.

35. If 2 thousand feet of lumber cost \$42, how much will 9 thousand feet cost?

36. If a man can drive 9 miles an hour and walk 3 miles an hour, how long will it take him to drive to a place 45 miles away and walk back?

37. A has 15 sheep; B has twice as many less 6. They are all sold for \$195. How much is that apiece?

38. If I had \$15 more I could buy 12 sheep at \$5 a head, but I expend my money for hay at \$9 a ton. How much hay do I buy?

39. A cistern filled with 100 gallons of water has a pipe that can empty it in 5 hours and another that supplies water at the rate of 15 gallons an hour. If both pipes are opened, how soon will it be emptied?

40. If an acre of ground will make 17 city lots, for how much apiece must the lots be sold to gain \$1400 on an acre bought for \$2000?

41. A man exchanged 9 horses worth \$200 apiece and a house worth \$1200, for 10 acres of land. How much did the land cost him per acre?

42. My butcher took back a ham weighing 12 pounds which he had sold me at 20 cents a pound, and gave me in exchange for the ham and 60 cents, a turkey weighing 20 pounds. How much per pound did the turkey cost me?

43. A grocer made a mixture consisting of 8 pounds of coffee that cost him 30 cents a pound, and 4 pounds that cost him 20 cents a pound. He sold the mixture so as to gain 40 cents. What was the selling price per pound?

44. A bought a horse for \$100 and sold it to B for \$150. Later he bought it back for \$125 and sold it again so as to gain \$40 on the entire transaction. What was the last selling price of the horse?

45. John takes 5 steps while his father takes 3. How many will each have taken when together they have taken 160 steps?

46. What I owe A is 3 times what I owe B. After I have paid both I have \$20 left out of a one-hundred-dollar bill. How much did I owe each?

47. If a man receives 40 pounds of sugar in exchange for 25 pounds of cheese at 8 cents per pound, what is the price of the sugar per pound?

FRACTIONS

18. 1. How many halves are there in 1 apple? in 2 apples?

2. How many halves are there in 3? in 5? in 4?

3. How many halves are there in 6? in 9? in 8?

4. A boy cut three apples into halves. How many halves were there?

5. If a half ton of coal costs \$3, how much will one ton cost? 4 tons?

6. If a half yard of silk is worth \$2, how much is one yard worth? 3 yards?

7. How many ones are there in 10 halves? in 16 halves? in 20 halves? in 18 halves? in 36 halves?

8. How many ones are there in 12 halves? in 14 halves? in 24 halves? in 22 halves? in 40 halves?

9. What is a half of 2? of 4? of 8? of 12?

10. What is a half of 6? of 10? of 20? of 16?

11. If 6 is half of a number, what is the number?

12. How many halves are there in 2 and 1 half?

SOLUTION:—Since in 1 there are 2 halves, in 2 there are 2 times 2 halves, or 4 halves; 4 halves and 1 half are 5 halves.

Therefore, in 2 and 1 half there are 5 halves.

13. How many halves are there in $3\frac{1}{2}$? in $5\frac{1}{2}$? in $8\frac{1}{2}$?

14. How many halves are there in $4\frac{1}{2}$? in $7\frac{1}{2}$? in $10\frac{1}{2}$?

15. How many ones are there in 11 halves?

SOLUTION:— Since 2 halves = one, 11 halves = as many ones as there are 2's in 11, or $5\frac{1}{2}$.

Therefore, 11 halves = $5\frac{1}{2}$.

16. How many ones are there in $\frac{12}{2}$? in $\frac{8}{2}$? in $\frac{17}{2}$?

17. How many ones are there in $\frac{15}{2}$? in $\frac{12}{2}$? in $\frac{22}{2}$?

18. What is a half of 7? of 9? of 15? of 21?

19. 1. How many thirds are there in 1? in 3? in 5? in 7? in 8? in 11? in 13? in 30?

2. How many thirds are there in 4? in 10? in 6? in 12? in 9? in 15? in 18? in 25?

3. If $\frac{1}{3}$ of a pie is worth 5 cents, how much is a whole pie worth? How much are 2 pies worth?

4. If $\frac{1}{3}$ of a melon costs 10 cents, how much will 2 melons cost?

5. How many ones are there in $\frac{6}{3}$? in $\frac{15}{3}$? in $\frac{12}{3}$? in $\frac{18}{3}$? in $\frac{22}{3}$? in $\frac{22}{3}$? in $\frac{48}{3}$? in $\frac{57}{3}$?

6. How many ones are there in $\frac{24}{3}$? in $\frac{9}{3}$? in $\frac{20}{3}$? in $\frac{27}{3}$? in $\frac{18}{3}$? in $\frac{26}{3}$? in $\frac{42}{3}$? in $\frac{51}{3}$?

7. How many thirds are there in $1\frac{1}{3}$? in $2\frac{2}{3}$? in $3\frac{1}{3}$? in $5\frac{2}{3}$? in $6\frac{2}{3}$? in $5\frac{1}{3}$? in $8\frac{1}{3}$? in $7\frac{2}{3}$?

8. How many thirds are there in $4\frac{2}{3}$? in $7\frac{1}{3}$? in $3\frac{2}{3}$? in $10\frac{1}{3}$? in $8\frac{2}{3}$? in $6\frac{1}{3}$? in $9\frac{2}{3}$? in $11\frac{2}{3}$?

9. How many ones are there in $\frac{7}{3}$? in $\frac{11}{3}$? in $\frac{17}{3}$? in $\frac{23}{3}$? in $\frac{22}{3}$? in $\frac{24}{3}$? in $\frac{12}{3}$? in $\frac{22}{3}$?

10. How many ones are there in $\frac{21}{3}$? in $\frac{14}{3}$? in $\frac{12}{3}$? in $\frac{26}{3}$? in $\frac{25}{3}$? in $\frac{26}{3}$? in $\frac{40}{3}$? in $\frac{27}{3}$?

11. If $\frac{2}{3}$ of a melon is worth 20 cents, how much is $\frac{1}{3}$ of the melon worth?

12. A man pays \$60 for $\frac{2}{3}$ of an acre of land. How much does he pay for $\frac{1}{3}$ of an acre?

13. If a man can walk 4 miles in $1\frac{1}{3}$ hours, how far can he walk in $\frac{1}{3}$ of an hour? in 1 hour? in 4 hours?

SUGGESTION:— $1\frac{1}{3}$ hours should be considered as $\frac{4}{3}$ of an hour.

14. For $1\frac{2}{3}$ yards of ribbon, Mary pays 15 cents. How much does she pay for $\frac{1}{3}$ of a yard? How much for a yard?

15. If $1\frac{1}{3}$ watermelons cost 40 cents, how much does $\frac{1}{3}$ of a watermelon cost? How much does one watermelon cost?

16. A man can do $\frac{1}{3}$ of a piece of work in 5 days. In how many days can he do the entire work?

17. How long does 1 ton of coal last if 3 tons last one month?

18. When $3\frac{2}{3}$ acres of land cost \$440, what is the cost of $\frac{1}{3}$ of an acre? of 1 acre?

19. If $\frac{2}{3}$ of my money is \$20, what is $\frac{1}{3}$ of my money? How much money have I?

20. For $1\frac{1}{3}$ weeks' work I pay \$16. How much do I pay for $\frac{1}{3}$ of a week's work? how much for a week's work?

21. If $1\frac{2}{3}$ cords of wood cost \$10, how much does $\frac{1}{3}$ of a cord cost? How much does one cord cost?

20. 1. How many fourths are there in 1? in 3? in 5? in 7? in 10? in 12? in 14?

2. How many fourths are there in 4? in 8? in 6?

3. How many ones are there in $\frac{4}{4}$? in $\frac{16}{4}$? in $\frac{12}{4}$?
4. How many ones are there in $\frac{24}{4}$? in $\frac{36}{4}$? in $\frac{44}{4}$?
5. How many fourths are there in $1\frac{1}{4}$? in $3\frac{1}{4}$? in $2\frac{3}{4}$? in $4\frac{3}{4}$? in $2\frac{1}{4}$? in $5\frac{3}{4}$? in $6\frac{1}{4}$?
6. Change $5\frac{3}{4}$ to fourths; $8\frac{1}{4}$; $6\frac{3}{4}$; $12\frac{1}{4}$; $10\frac{3}{4}$; $9\frac{1}{4}$.
7. How many ones are there in $\frac{16}{4}$? in $\frac{28}{4}$? in $\frac{12}{4}$?
8. How many ones are there in $\frac{18}{4}$? in $\frac{22}{4}$? in $\frac{17}{4}$?
9. If $\frac{1}{4}$ of a yard of ribbon is worth 10 cents, how much is a yard worth?

10. I bought $\frac{3}{4}$ of a cord of wood for \$6. What was the cost of $\frac{1}{4}$ of a cord? of one cord?

11. When $1\frac{1}{4}$ pounds of mutton cost 20 cents, how much does $\frac{1}{4}$ of a pound cost? one pound?

SUGGESTION:—Consider $1\frac{1}{4}$ as $\frac{5}{4}$.

12. I paid \$28 for $1\frac{3}{4}$ tons of hay. How much did $\frac{1}{4}$ of a ton cost me? How much did 1 ton cost?

13. If $5\frac{1}{4}$ tons of coal cost \$21, how much did $\frac{1}{4}$ of a ton cost? How much did 1 ton cost?

14. What is $\frac{1}{4}$ of 8? of 20? of 32? of 40?

15. How much is $\frac{3}{4}$ of 8? of 12? of 28? of 16?

16. How much is $\frac{1}{4}$ of 17? of 23? of 11? of 15?

17. How much is $\frac{1}{4}$ of 7? of 27? of 18? of 29?

18. How much is $\frac{3}{4}$ of 7?

SOLUTION:—Since $\frac{3}{4}$ is equal to $\frac{1}{4}$ of 3, $\frac{3}{4}$ of 7 is the same as $\frac{1}{4}$ of 3 times 7. 3 times 7 = 21, and $\frac{1}{4}$ of 21 = $5\frac{1}{4}$.

Therefore, $\frac{3}{4}$ of 7 = $5\frac{1}{4}$.

19. Find $\frac{3}{4}$ of 9; of 5; of 11; of 3; of 6; of 7.

20. A man burned in a single month $\frac{3}{4}$ of 10 tons of coal. How much did he burn?

21. If $2\frac{3}{4}$ bushels of wheat cost \$2.20, how much must be paid for $\frac{1}{4}$ of a bushel? How much must be paid for one bushel?

22. A farmer had 11 tons of hay, and sold $\frac{3}{4}$ of it. How many tons did he sell?

23. In $1\frac{3}{4}$ hours a boy rode 14 miles on a bicycle. How far did he ride in $\frac{1}{4}$ of an hour? How far did he ride in one hour?

24. A man bought a cow for \$40, and sold it for $\frac{3}{4}$ of what it cost. How much did he get for it?

25. How much is molasses per gallon when $2\frac{1}{4}$ gallons cost 90 cents?

21. 1. How many fifths are there in 1? in 2? in 8? in 5? in 9? in 13? in 18? in 10?

2. How many fifths are there in 7? in 12? in 6? in 11? in 6? in 14? in 17? in 19?

3. How many ones are there in $\frac{10}{5}$? in $\frac{25}{5}$? in $\frac{45}{5}$? in $\frac{35}{5}$? in $\frac{15}{5}$? in $\frac{20}{5}$? in $\frac{30}{5}$? in $\frac{55}{5}$?

4. How many ones are there in $\frac{50}{5}$? in $\frac{60}{5}$? in $\frac{40}{5}$? in $\frac{100}{5}$? in $\frac{55}{5}$? in $\frac{70}{5}$? in $\frac{35}{5}$? in $\frac{20}{5}$?

5. How many fifths are there in $1\frac{1}{5}$? in $4\frac{3}{5}$? in $2\frac{4}{5}$? in $7\frac{2}{5}$? in $11\frac{1}{5}$? in $8\frac{4}{5}$? in $7\frac{3}{5}$? in $6\frac{1}{5}$?

6. How many fifths are there in $5\frac{2}{5}$? in $4\frac{1}{5}$? in $7\frac{4}{5}$? in $10\frac{3}{5}$? in $8\frac{4}{5}$? in $12\frac{3}{5}$? in $13\frac{2}{5}$? in $15\frac{1}{5}$?

7. How many ones are there in $\frac{12}{5}$? in $\frac{24}{5}$? in $\frac{8}{5}$? in $\frac{12}{5}$? in $\frac{16}{5}$? in $\frac{18}{5}$? in $\frac{32}{5}$? in $\frac{21}{5}$? in $\frac{36}{5}$?

8. If $\frac{1}{2}$ of a ton of hay is sold for \$3, for how much should a ton sell?

9. A boy lost 10 marbles, which were $\frac{2}{5}$ of all he had at first. How many had he at first?

10. If $\frac{3}{8}$ of a number is 9, what is the number?

11. What is $\frac{1}{3}$ of 10? of 20? of 35? of 25? of 15? of 60? of 30? of 45? of 55? of 40?

12. What is $\frac{2}{5}$ of 11? of 23? of 7? of 19? of 14? of 29? of 18? of 20? of 30? of 24?

SUGGESTION:— $\frac{1}{3}$ of 11 is the same as $\frac{1}{3}$ of 2 times 11.

13. How much is $\frac{3}{4}$ of 9? of 12? of 15? of 18?

14. What is $\frac{2}{5}$ of 6? of 13? of 8? of 11? of 4? of 12?

15. What is $\frac{1}{4}$ of 8? of 4? of 6? of 7? of 11?

16. How much coal do I sell, if I have 9 tons and sell $\frac{1}{3}$ of it?

17. What must be paid for $\frac{1}{4}$ of a ton of hay at \$15 a ton?

18. A man received \$30 for plowing $\frac{2}{3}$ of a field. How much should he get for plowing the whole field?

19. A watermelon was cut into 5 equal pieces, and 3 of them were sold for 24 cents. At that rate, for how much would the whole melon sell?

20. If $\frac{2}{5}$ of a farm is sold for \$2000, how much should be received for the whole farm?

21. I sold $\frac{3}{4}$ of my lambs for \$60. At the same rate, how much should I get for all of them?

22. John had 20 marbles, and James had $\frac{3}{4}$ as many. How many had James?

23. A man has 60 miles to travel. When he has gone $\frac{2}{3}$ of the distance, how far has he traveled?

22. 1. How much is $\frac{2}{3}$ of 9? of 15? of 30? of 12? of 21? of 27? of 18? of 24? of 33? of 36?

2. What is $\frac{3}{4}$ of 8? of 12? of 32? of 28? of 16? of 40? of 60? of 100? of 20? of 24? of 36?

3. How much is $\frac{4}{5}$ of 10? of 30? of 40? of 60? of 25? of 35? of 15? of 20? of 45? of 55?

4. What is $\frac{5}{6}$ of 18? of 30? of 12? of 60? of 42? of 72? of 48? of 24? of 36? of 54?

What is the value of :

5. $\frac{5}{8}$ of 24? of 40? of 64? of 56? of 96?

6. $\frac{7}{9}$ of 21? of 35? of 63? of 28? of 70?

7. $\frac{8}{9}$ of 45? of 27? of 72? of 36? of 108?

8. $\frac{7}{12}$ of 60? of 36? of 144? of 120? of 72?

9. $\frac{6}{11}$ of 66? of 110? of 88? of 121? of 132?

10. $\frac{8}{10}$ of 40? of 70? of 130? of 190? of 210?

11. How much is $\frac{3}{8}$ of 8? of 10? of 11? of 7? of 5?

12. How much is $\frac{3}{4}$ of 7? of 5? of 9? of 3? of 10?

13. Find $\frac{2}{5}$ of 8; of 11; of 6; of 7; of 13; of 21.

What is the value of :

14. $\frac{3}{8}$ of 9? of 12?

19. $\frac{5}{8}$ of 10? of 5?

15. $\frac{4}{9}$ of 6? of 12?

20. $\frac{3}{8}$ of 20? of 15?

16. $\frac{5}{8}$ of 11? of 20?

21. $\frac{4}{9}$ of 25? of 20?

17. $\frac{7}{9}$ of 12? of 8?

22. $\frac{3}{10}$ of 7? of 21?

18. $\frac{5}{7}$ of 11? of 13?

23. $\frac{5}{12}$ of 13? of 100?

24. John worked 8 hours, and Henry $\frac{3}{4}$ as long.
How long did Henry work?

25. I paid \$9 for a cord of wood, and $\frac{2}{3}$ as much for a ton of coal. At that rate find the cost of 10 tons of coal.

26. A watch cost \$28 and a chain $\frac{5}{7}$ as much. How much did both cost?

27. If a man paid $\frac{5}{8}$ of \$96 for 4 tons of hay, how much did one ton cost?

28. Two boys together caught 56 fishes. If one of them caught $\frac{4}{7}$ of the number, how many did the other catch?

29. A barrel of sirup contained 42 gallons; $\frac{5}{7}$ of it was sold at 60 cents a gallon. How much was received for what was sold?

30. Mr. Howard is 60 years old, and $\frac{4}{3}$ of his age is 3 times his son's age. How old is his son?

31. One boy had $\frac{5}{8}$ of a quart of chestnuts, and another had $\frac{7}{12}$ of a quart. How many chestnuts had both if there were 96 chestnuts in a quart?

32. Three boys had together 240 marbles. How many of them belonged to the third boy, if the shares of the first and second boys were respectively $\frac{1}{3}$ and $\frac{1}{4}$ of the whole number?

33. A grocer sold $\frac{1}{6}$ of a tub of butter to one customer and $\frac{1}{7}$ of it to another customer. If the tub contained 42 pounds at first, how much remained?

34. A boy had 72 cents and earned $\frac{5}{6}$ as much as he had. How much had he then?

35. Samuel rode in the forenoon 36 miles on his bicycle and in the afternoon $\frac{7}{9}$ as far. How far did he ride that day?

36. A lady bought $\frac{5}{8}$ of a piece of sheeting containing 48 yards, paying 20 cents a yard for it. How much change should she receive out of a ten-dollar bill?

37. A farmer had 360 bushels of wheat. He sold $\frac{2}{3}$ of it to one man and $\frac{2}{7}$ of the remainder to another. What was the value of what was left, at 50 cents a bushel?

23. 1. How many fourths are there in $\frac{1}{2}$?

SOLUTION:—Since there are $\frac{1}{4}$ in 1, in $\frac{1}{2}$ there are $\frac{1}{2}$ of $\frac{1}{4}$ or $\frac{1}{2}$. Therefore there are 2 fourths in $\frac{1}{2}$.

2. How many sixths are there in $\frac{1}{2}$? in $\frac{1}{3}$? in $\frac{2}{3}$?

3. How many fourths are there in $\frac{3}{2}$? in $\frac{5}{2}$? in $3\frac{1}{2}$?

4. How many eighths are there in $\frac{1}{2}$? in $\frac{1}{4}$? in $\frac{3}{4}$? in $1\frac{1}{2}$? in $2\frac{1}{4}$? in $3\frac{1}{4}$? in $2\frac{1}{2}$? in $4\frac{1}{4}$?

5. Change to tenths: $\frac{1}{5}$; $\frac{2}{5}$; $\frac{1}{2}$; $\frac{3}{5}$; $1\frac{2}{5}$; $2\frac{1}{2}$.

6. Reduce to twelfths: $\frac{1}{2}$; $\frac{1}{3}$; $\frac{1}{4}$; $\frac{2}{3}$; $\frac{3}{4}$; $\frac{1}{6}$; $\frac{5}{6}$; $1\frac{1}{4}$; $2\frac{1}{2}$.

7. Reduce to eighteenthths: $\frac{5}{6}$; $\frac{1}{2}$; $\frac{1}{3}$; $\frac{5}{9}$; $\frac{2}{3}$; $\frac{7}{9}$; $1\frac{1}{3}$; $1\frac{1}{2}$.

8. By what must the terms of the fraction $\frac{1}{2}$ be multiplied to reduce the fraction to fourths? to tenths? to twelfths? to eighteenthths?

9. What is the effect on the value of a fraction of multiplying its terms by the same number?

10. How many twentieths are there in $\frac{1}{2}$? in $\frac{4}{5}$? in $\frac{7}{10}$? in $\frac{3}{5}$? in $2\frac{1}{2}$? in $\frac{9}{10}$?

11. Reduce to twenty-fourths: $\frac{2}{3}$; $\frac{3}{4}$; $\frac{5}{8}$; $\frac{1}{2}$; $\frac{5}{6}$; $1\frac{1}{2}$; $1\frac{1}{4}$; $\frac{7}{8}$.

12. Reduce $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{5}$, $\frac{2}{3}$, $\frac{2}{5}$, $\frac{5}{6}$, $\frac{4}{15}$, $\frac{9}{10}$ and $1\frac{1}{5}$ to thirtieths.

13. Reduce $\frac{3}{8}$, $\frac{4}{9}$, $\frac{5}{12}$, $\frac{1}{6}$, and $\frac{1}{2}$ to equivalent fractions having a common denominator.

14. Change $\frac{4}{5}$, $\frac{5}{6}$, $\frac{7}{15}$, $\frac{1}{2}$, $\frac{3}{8}$, and $\frac{2}{3}$ to equivalent fractions having their least common denominator.

Reduce to equivalent fractions having their least common denominator :

15. $\frac{1}{3}$, $\frac{2}{4}$, $\frac{5}{6}$, $\frac{3}{8}$.

25. $\frac{1}{6}$, $\frac{5}{8}$, $2\frac{3}{4}$, $\frac{1}{2}$, $\frac{4}{9}$.

16. $\frac{3}{8}$, $\frac{5}{6}$, $\frac{7}{9}$, $\frac{5}{12}$.

26. $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{6}$, $\frac{1}{12}$, $\frac{1}{2}$.

17. $\frac{5}{8}$, $\frac{3}{6}$, $\frac{7}{10}$, $\frac{1}{4}$.

27. $\frac{11}{18}$, $\frac{4}{9}$, $\frac{7}{36}$, $\frac{5}{6}$, $\frac{2}{3}$.

18. $\frac{11}{20}$, $\frac{9}{10}$, $\frac{7}{40}$, $\frac{4}{5}$.

28. $\frac{3}{7}$, $\frac{4}{21}$, $\frac{5}{6}$, $\frac{9}{14}$, $\frac{2}{3}$.

19. $\frac{7}{8}$, $\frac{13}{24}$, $\frac{3}{16}$, $\frac{1}{4}$.

29. $\frac{4}{7}$, $\frac{1}{2}$, $\frac{5}{14}$, $\frac{9}{28}$, $\frac{3}{4}$.

20. $\frac{1}{4}$, $1\frac{1}{2}$, $\frac{5}{8}$, $\frac{7}{16}$.

30. $\frac{3}{4}$, $\frac{3}{8}$, $\frac{3}{8}$, $\frac{3}{2}$, $\frac{3}{12}$.

21. $\frac{3}{5}$, $\frac{9}{10}$, $2\frac{1}{2}$, $\frac{1}{20}$.

31. $\frac{3}{4}$, $\frac{5}{11}$, $\frac{3}{44}$, $\frac{1}{2}$, $\frac{7}{22}$.

22. $\frac{1}{5}$, $\frac{1}{3}$, $2\frac{3}{5}$, $\frac{1}{15}$.

32. $\frac{7}{2}$, $\frac{7}{8}$, $\frac{7}{12}$, $\frac{7}{24}$, $1\frac{1}{6}$, $\frac{7}{8}$.

23. $1\frac{7}{8}$, $2\frac{1}{4}$, $\frac{3}{2}$, $\frac{5}{4}$.

33. $\frac{5}{10}$, $\frac{7}{15}$, $\frac{4}{5}$, $\frac{19}{30}$, $\frac{1}{6}$, $\frac{1}{2}$.

24. $\frac{7}{2}$, $1\frac{1}{10}$, $\frac{4}{5}$, $1\frac{1}{5}$.

34. $\frac{3}{4}$, $\frac{5}{8}$, $\frac{7}{8}$, $\frac{3}{16}$, $\frac{7}{12}$, $\frac{5}{24}$.

35. A man owned $\frac{1}{3}$ of a mill and gave one fifteenth of the mill to each of his children. How many children were there?

36. If $\frac{3}{4}$ of a melon is cut into twelfths and sold at 5 cents for each piece, how much will be received for it?

37. A girl cut $1\frac{3}{8}$ yards of ribbon into pieces each containing one ninth of a yard. How many pieces were there?

38. A coal dealer divided equally among some poor families $1\frac{1}{2}$ tons of coal, giving to each family one tenth of a ton. How many families were there?

24. 1. How many fifths are there in $\frac{13}{5}$?

SOLUTION:—Since $\frac{1}{5} = \frac{1}{5}$, $\frac{13}{5}$ = as many fifths as $\frac{1}{5}$ is contained times in $\frac{13}{5}$, which is 4 times.

Therefore there are 4 fifths in $\frac{13}{5}$.

2. How many halves are there in $\frac{4}{3}$? in $\frac{8}{3}$? in $\frac{12}{3}$? in $\frac{16}{3}$? in $\frac{20}{3}$? in $\frac{24}{3}$?

3. How many thirds are there in $\frac{4}{3}$? in $\frac{10}{3}$? in $\frac{16}{3}$? in $\frac{22}{3}$? in $\frac{28}{3}$? in $\frac{34}{3}$? in $\frac{40}{3}$?

4. How many fourths are there in $\frac{3}{2}$? in $\frac{6}{2}$? in $\frac{9}{2}$? in $\frac{12}{2}$? in $\frac{15}{2}$? in $\frac{18}{2}$? in $\frac{21}{2}$?

5. Reduce $\frac{16}{32}$, $\frac{80}{80}$, $\frac{25}{25}$, $\frac{45}{45}$, $\frac{30}{30}$, and $\frac{42}{42}$ to fourths.

6. To reduce $\frac{12}{4}$ to fourths, by what do you divide the terms of the fraction? To reduce $\frac{20}{4}$ to sixths, by what do you divide?

7. Express each of the following fractions in smaller or lower terms: $\frac{24}{36}$; $\frac{48}{60}$; $\frac{81}{90}$; $\frac{45}{60}$; $\frac{36}{48}$; $\frac{72}{96}$.

8. Reduce each of the following fractions to its lowest terms: $\frac{12}{15}$; $\frac{18}{30}$; $\frac{30}{36}$; $\frac{12}{30}$; $\frac{15}{25}$; $\frac{25}{35}$; $\frac{42}{56}$.

9. Change to their simplest form: $\frac{15}{15}$, $\frac{18}{18}$, $\frac{22}{22}$, $\frac{25}{25}$, $\frac{35}{35}$, $\frac{45}{45}$, $\frac{55}{55}$, $\frac{65}{65}$, $\frac{75}{75}$, $\frac{85}{85}$, $\frac{95}{95}$.

10. I paid $\frac{1}{3}$ of \$15 for a silk hat. How much did it cost?

SUGGESTION:—Reduce the fractions to their lowest terms before solving the problem.

11. A man received $\frac{2}{3}$ of \$70 for his watch. How much did he get for it?

12. How much is $\frac{7}{10}$ of 57? $\frac{4}{9}$ of 70? $\frac{2}{3}$ of 60? $\frac{2}{5}$ of 100? $\frac{3}{5}$ of 14? $\frac{2}{4}$ of 25? $\frac{1}{2}$ of 36?

13. A boy had 48 marbles and lost $\frac{1}{3}$ of them; he then gained $\frac{3}{8}$ as many as he had left. How many did he then have?

14. If $\frac{1}{3}$ of what was paid for a farm was \$6000, what was the entire cost of the farm?

15. A farmer sold $\frac{3}{4}$ of his hay at \$12 per ton, and received for it \$240. How much hay had he?

16. After sailing 3000 miles, a ship has completed $\frac{1}{5}$ of her voyage. What is the length of her voyage?

17. Mary's dress cost $\frac{3}{5}$ as much as her cloak. How much did her dress cost if she paid \$36 for the cloak?

18. In a school registering 56 pupils $\frac{1}{4}$ of them are absent. How many are present?

19. In a race between two boats, when the winner had gone 120 miles the other boat had gone only $\frac{4}{5}$ of this distance. How far behind was the second boat?

20. How old is John if $\frac{3}{5}$ of 60 years is 3 times his age?

21. A grocer sells $\frac{3}{4}$ of a pound of butter for 25 cents. At that rate, how much will he get for 8 pounds?

25. 1. Change to thirds: $3\frac{2}{3}$; $5\frac{1}{3}$; 8; $10\frac{2}{3}$; $4\frac{1}{3}$; $9\frac{2}{3}$.

2. Change to fourths: $8\frac{3}{4}$; $9\frac{1}{4}$; $12\frac{3}{4}$; 11; $7\frac{3}{4}$; $6\frac{3}{4}$.

3. How many fifths are there in $6\frac{3}{5}$? in $5\frac{4}{5}$? in $8\frac{2}{5}$?

4. In reducing $8\frac{4}{5}$ to fifths, by what is 8 multiplied? What is done with the 4?

5. Reduce $3\frac{1}{8}$ to an improper fraction; $5\frac{3}{8}$; $7\frac{5}{8}$; $4\frac{7}{8}$; $8\frac{3}{8}$; $9\frac{5}{8}$; $10\frac{7}{8}$; $15\frac{1}{8}$; $20\frac{5}{8}$; $25\frac{7}{8}$.

6. Reduce $7\frac{7}{8}$ to an improper fraction; $8\frac{1}{8}$; $10\frac{5}{8}$; $12\frac{3}{8}$; $6\frac{7}{8}$; $5\frac{3}{8}$; $8\frac{7}{8}$; $9\frac{5}{8}$; $11\frac{1}{8}$; $10\frac{7}{8}$.

7. How many eighths are there in $10\frac{4}{8}$? in $6\frac{7}{8}$? in $12\frac{1}{8}$? in $9\frac{3}{8}$?

8. Reduce to improper fractions: $11\frac{3}{8}$; $5\frac{5}{8}$; $8\frac{3}{8}$; $6\frac{1}{8}$.

9. How many ones are there in $1\frac{5}{6}$? in $2\frac{3}{4}$? in $3\frac{2}{3}$?

10. Change to units: $2\frac{1}{8}$; $3\frac{2}{4}$; $3\frac{3}{6}$; $4\frac{5}{6}$; $4\frac{7}{8}$.

11. Change to units: $1\frac{6}{7}$; $2\frac{1}{4}$; $2\frac{2}{5}$; $1\frac{7}{8}$; $2\frac{5}{7}$.

12. Reduce to whole or mixed numbers: $2\frac{5}{8}$; $3\frac{2}{5}$; $1\frac{2}{4}$; $3\frac{7}{8}$; $4\frac{3}{4}$; $5\frac{1}{8}$; $3\frac{3}{6}$; $6\frac{3}{8}$; $6\frac{5}{9}$; $4\frac{2}{4}$; $4\frac{3}{6}$.

13. Change to whole or mixed numbers: $4\frac{3}{8}$; $3\frac{7}{5}$; $5\frac{3}{10}$; $6\frac{7}{8}$; $7\frac{2}{9}$; $5\frac{7}{9}$; $6\frac{0}{9}$; $5\frac{6}{6}$; $3\frac{2}{9}$; $6\frac{7}{7}$; $3\frac{3}{6}$.

14. Reduce to mixed numbers: $4\frac{5}{6}$; $9\frac{0}{11}$; $7\frac{7}{8}$; $7\frac{6}{9}$; $8\frac{8}{9}$.

15. Reduce to mixed numbers: $1\frac{20}{11}$; $1\frac{30}{20}$; $1\frac{08}{26}$; $1\frac{32}{20}$.

16. Pies cut into sixths are sold at 5 cents for each sixth. How much is received for one dozen pies?

17. A man plows a field of $5\frac{5}{8}$ acres. If he plows one sixth of an acre per hour, how long does it take him to plow the field?

18. Maud divided $4\frac{1}{3}$ yards of ribbon among her schoolmates, giving each one ninth of a yard. How many schoolmates had she?

19. How far can a man walk in $6\frac{1}{2}$ hours at the rate of 1 mile in 15 minutes?

20. How many more fifths than fourths are there in 1000?

21. A grocer bought $40\frac{3}{4}$ gallons of vinegar at 20 cents a gallon, and retailed it at 10 cents for one fourth of a gallon. How much did he gain?

22. How much will be gained on $5\frac{3}{4}$ reams of paper bought for \$10 and sold at 20 cents a quire, there being 20 quires in a ream?

26. 1. How many halves are there in $\frac{1}{2} + \frac{1}{2}$? How many units?

2. How many thirds are there in $\frac{1}{3} + \frac{2}{3}$? in $\frac{2}{3} + \frac{2}{3} + \frac{2}{3}$? How many units?

3. What is the sum of $\frac{3}{4}$ and $\frac{1}{4}$? of $\frac{3}{4}$ and $\frac{2}{4}$ and $\frac{1}{4}$? of $\frac{5}{4}$ and $\frac{1}{4}$ and $\frac{3}{4}$? $\frac{5}{4}$ and $\frac{3}{4}$ and $\frac{5}{4}$?

4. What is the difference between $\frac{4}{5}$ and $\frac{2}{5}$? $\frac{3}{5}$ and $\frac{1}{5}$? $\frac{5}{8}$ and $\frac{2}{8}$? $\frac{7}{8}$ and $\frac{3}{8}$? $\frac{9}{10}$ and $\frac{4}{10}$?

5. How many fourths are there in $\frac{1}{4}$ plus $\frac{1}{2}$? in $\frac{3}{4}$ plus $\frac{1}{2}$? in $\frac{5}{4}$ plus $\frac{1}{2}$? in $\frac{3}{4}$ plus $\frac{3}{2}$?

6. How many sixths are there in $\frac{1}{3} + \frac{1}{2}$? in $\frac{1}{6} + \frac{1}{3}$? in $\frac{1}{6} + \frac{1}{2}$? in $\frac{5}{6} + \frac{1}{2}$? in $\frac{5}{6} + \frac{1}{2} + \frac{1}{3}$?

7. How many more sixths are there in $\frac{1}{2}$ than in $\frac{1}{3}$? in $\frac{2}{3}$ than in $\frac{1}{2}$? in $\frac{5}{6}$ than in $\frac{1}{3}$?

8. What is the sum of $\frac{1}{2}$ and $\frac{1}{4}$? $\frac{1}{4}$ and $\frac{1}{8}$? $\frac{1}{8}$ and $\frac{1}{16}$?

9. Find the sum of: $\frac{1}{3}$ and $\frac{1}{6}$; $\frac{2}{3}$ and $\frac{5}{6}$; $\frac{3}{4}$ and $\frac{2}{8}$; $\frac{3}{4}$ and $\frac{7}{8}$; $\frac{3}{8}$ and $\frac{7}{10}$.

10. What is the value of $\frac{5}{6} + \frac{7}{12}$? $\frac{5}{8} + \frac{11}{16}$? $\frac{4}{9} + \frac{2}{3}$? $\frac{1}{6} + \frac{5}{18}$? $\frac{5}{9} + \frac{7}{18}$?

What is the value of:

11. $\frac{1}{3} + \frac{5}{6} + \frac{7}{12}$? 17. $\frac{1}{2} + \frac{2}{5} + \frac{3}{10}$? 23. $\frac{2}{3} + \frac{1}{15} + \frac{2}{5}$?

12. $\frac{1}{2} + \frac{3}{4} + \frac{5}{8}$? 18. $\frac{1}{3} + \frac{2}{5} + \frac{7}{15}$? 24. $\frac{1}{3} + \frac{1}{6} + \frac{11}{12}$?

13. $\frac{1}{3} + \frac{1}{4} + \frac{5}{12}$? 19. $\frac{1}{2} + \frac{2}{7} + \frac{11}{14}$? 25. $\frac{5}{6} + \frac{2}{9} + \frac{7}{18}$?

14. $\frac{1}{3} + \frac{1}{4} + \frac{1}{2}$? 20. $\frac{3}{5} + \frac{1}{2} + \frac{9}{10}$? 26. $\frac{1}{4} + \frac{2}{5} + \frac{9}{20}$?

15. $\frac{2}{3} + \frac{1}{2} + \frac{7}{12}$? 21. $\frac{1}{2} + \frac{3}{4} + \frac{7}{16}$? 27. $\frac{1}{2} + \frac{3}{4} + \frac{17}{20}$?

16. $\frac{3}{4} + \frac{1}{6} + \frac{11}{12}$? 22. $\frac{1}{4} + \frac{5}{6} + \frac{11}{12}$? 28. $\frac{7}{9} + \frac{1}{3} + \frac{5}{18}$?

29. Mary bought $\frac{1}{2}$ a yard of ribbon at one time, and $\frac{1}{3}$ of a yard at another time. How much ribbon did she buy?

30. A man had $\frac{5}{8}$ of an acre of land and bought another piece containing $\frac{1}{2}$ of an acre. How much land had he then?

31. What is the sum of $\frac{2}{3}$ and $\frac{3}{4}$?

SUGGESTION:— $\frac{2}{3}$ equals $\frac{8}{12}$, and $\frac{3}{4}$ equals $\frac{9}{12}$.

32. Find the sum of: $\frac{1}{2}$ and $\frac{2}{3}$; $\frac{1}{2}$ and $\frac{4}{5}$; $\frac{1}{4}$ and $\frac{1}{5}$; $\frac{4}{5}$ and $\frac{1}{4}$; $\frac{1}{2}$ and $\frac{4}{7}$; $\frac{2}{3}$ and $\frac{4}{5}$.

33. How much is $2\frac{1}{2} + 3\frac{1}{3}$?

SOLUTION:—Since $\frac{1}{2} = \frac{3}{6}$, and $\frac{1}{3} = \frac{2}{6}$, the sum of $2\frac{1}{2}$ and $3\frac{1}{3}$ is the same as the sum of $2\frac{3}{6}$ and $3\frac{2}{6}$, or $5\frac{5}{6}$.

Therefore $2\frac{1}{2} + 3\frac{1}{3} = 5\frac{5}{6}$.

34. Find the sum of: $1\frac{1}{2} + 3\frac{1}{6}$; $4\frac{2}{3} + 5\frac{1}{2}$; $6\frac{1}{3} + 5\frac{1}{2} + 4\frac{5}{6}$; $5\frac{2}{3} + 7\frac{5}{6}$; $7\frac{3}{4} + 3\frac{7}{8}$.

35. A lady at one time bought $2\frac{3}{4}$ yards of velvet, and at another time $3\frac{1}{2}$ yards. How much did she buy in all?

36. A man walked $3\frac{1}{2}$ miles, $3\frac{2}{3}$ miles, and $3\frac{5}{6}$ miles during the first three hours of a journey. How far did he walk in all?

37. A butcher sent $7\frac{1}{2}$ pounds of meat to one customer, and $8\frac{3}{4}$ pounds to another. How much did he send to both?

What is the sum of:

38. $\frac{5}{9}$ and $\frac{1}{6}$? 42. $\frac{4}{7}$ and $\frac{1}{3}$? 46. $\frac{2}{5}$ and $\frac{5}{6}$?

39. $\frac{3}{7}$ and $\frac{1}{2}$? 43. $\frac{3}{4}$ and $\frac{3}{5}$? 47. $\frac{1}{3}$, $\frac{1}{5}$, and $\frac{1}{6}$?

40. $\frac{5}{7}$ and $\frac{2}{3}$? 44. $\frac{3}{8}$ and $\frac{2}{5}$? 48. $\frac{2}{3}$, $\frac{2}{5}$, and $\frac{5}{6}$?

41. $\frac{4}{5}$ and $\frac{1}{6}$? 45. $\frac{5}{6}$ and $\frac{1}{2}$? 49. $\frac{4}{15}$, $\frac{8}{10}$, and $\frac{1}{2}$?

50. $\frac{4}{9}$, $\frac{5}{12}$, and $\frac{1}{3}$?
51. $\frac{5}{8}$, $\frac{7}{12}$, and $\frac{5}{9}$?
52. $2\frac{1}{3}$ and $3\frac{1}{2}$?
53. $4\frac{1}{4}$ and $5\frac{2}{3}$?
54. $7\frac{1}{3}$ and $4\frac{3}{4}$?
55. $5\frac{4}{9}$ and $6\frac{5}{8}$?
56. $4\frac{1}{2}$, $3\frac{1}{3}$, and $12\frac{1}{4}$?
57. $7\frac{5}{8}$, $5\frac{3}{4}$, and $20\frac{1}{2}$?
58. $8\frac{2}{3}$, $7\frac{5}{8}$, and $5\frac{1}{2}$?
59. $6\frac{2}{3}$, $7\frac{2}{3}$, and $8\frac{5}{8}$?
60. $7\frac{4}{5}$, $10\frac{3}{4}$, and $9\frac{1}{2}$?
61. $5\frac{4}{9}$, $4\frac{5}{8}$, and $3\frac{1}{4}$?
62. A man sold $\frac{5}{8}$ of an acre of land at one time, and $\frac{2}{3}$ of an acre at another time. How much did he sell?
63. Jane studied her geography $\frac{3}{4}$ of an hour and her arithmetic $\frac{4}{5}$ of an hour. How long did she study?
64. A farmer sold $12\frac{3}{4}$ tons of hay and kept $10\frac{5}{8}$ tons. How many tons had he at first?
65. Annie had 45 roses. She gave her sister $\frac{3}{5}$ of them, and her brother $\frac{2}{5}$ of them. How many had she left?
66. If I add together $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$ of a certain number, the sum is 1300. What is the number?
SUGGESTION: — $\frac{1}{2} + \frac{1}{3} + \frac{1}{4}$ of a number is $1\frac{1}{12}$ of the number.
Therefore $1\frac{1}{12}$ of the number is 1300.
67. My age increased by its $\frac{1}{2}$ and its $\frac{1}{3}$ is 77 years. How old am I?
68. A watch costs \$70, and $\frac{2}{3}$ of its cost is twice the cost of the chain. How much does the chain cost?
69. If $3\frac{3}{4}$ tons of coal are burned in December, and $4\frac{4}{5}$ tons in January, how much is burned in the two months?
70. From a piece of cloth there were cut at one time $4\frac{5}{8}$ yards, and at another $6\frac{2}{3}$ yards. If $20\frac{1}{2}$ yards were left, how many yards were there in the piece?

27. 1. What is the difference between $\frac{7}{8}$ and $\frac{1}{2}$? $\frac{5}{8}$ and $\frac{1}{4}$? $\frac{7}{16}$ and $\frac{3}{8}$?

2. Subtract $\frac{1}{2}$ from $\frac{5}{8}$; $\frac{1}{2}$ from $\frac{5}{6}$; $\frac{1}{2}$ from $\frac{7}{10}$; $\frac{1}{2}$ from $\frac{1}{2}$; $\frac{1}{2}$ from $\frac{1}{6}$; $\frac{1}{2}$ from $\frac{1}{8}$.

3. Find the value of: $\frac{8}{9} - \frac{2}{3}$; $\frac{1}{12} - \frac{2}{3}$; $\frac{1}{12} - \frac{3}{4}$; $\frac{1}{12} - \frac{5}{6}$; $\frac{1}{8} - \frac{5}{8}$; $\frac{1}{8} - \frac{3}{8}$.

4. What is the difference between $\frac{3}{4}$ and $\frac{2}{3}$? $\frac{5}{6}$ and $\frac{1}{4}$? $\frac{4}{5}$ and $\frac{2}{3}$? $\frac{5}{6}$ and $\frac{1}{3}$?

5. Subtract $\frac{1}{4}$ from $\frac{1}{3}$; $\frac{1}{3}$ from $\frac{1}{2}$; $\frac{1}{6}$ from $\frac{1}{3}$; $\frac{1}{6}$ from $\frac{1}{2}$; $\frac{3}{4}$ from $\frac{5}{6}$; $\frac{2}{3}$ from $\frac{7}{8}$.

6. What is the value of $\frac{8}{9} - \frac{1}{2}$? $\frac{5}{6} - \frac{2}{3}$? $\frac{5}{8} - \frac{1}{6}$? $\frac{7}{8} - \frac{5}{6}$? $\frac{1}{12} - \frac{1}{6}$? $\frac{1}{18} - \frac{2}{3}$?

7. What is the value of: $\frac{4}{5} - \frac{3}{4}$? $\frac{4}{5} - \frac{2}{3}$? $\frac{5}{6} - \frac{5}{12}$? $\frac{7}{8} - \frac{5}{12}$? $\frac{1}{12} - \frac{1}{2}$? $\frac{7}{8} - \frac{2}{3}$?

8. Subtract $\frac{4}{5}$ from $\frac{5}{6}$; $\frac{2}{3}$ from $\frac{4}{5}$; $\frac{4}{5}$ from $\frac{2}{3}$; $\frac{2}{3}$ from $\frac{3}{4}$; $\frac{2}{3}$ from $\frac{8}{9}$; $\frac{2}{3}$ from $\frac{6}{7}$.

Subtract :

9. $\frac{2}{3}$ from $\frac{1}{5}$. 15. $\frac{4}{5}$ from $\frac{1}{20}$. 21. $\frac{2}{7}$ from $\frac{1}{18}$.

10. $\frac{3}{4}$ from $\frac{1}{6}$. 16. $\frac{3}{4}$ from $\frac{1}{20}$. 22. $\frac{5}{6}$ from $\frac{2}{30}$.

11. $\frac{2}{3}$ from $\frac{1}{18}$. 17. $\frac{5}{6}$ from $\frac{2}{24}$. 23. $\frac{5}{9}$ from $\frac{2}{45}$.

12. $\frac{3}{4}$ from $\frac{2}{10}$. 18. $\frac{6}{7}$ from $\frac{7}{8}$. 24. $\frac{3}{8}$ from $\frac{1}{6}$.

13. $\frac{2}{3}$ from $\frac{2}{30}$. 19. $\frac{7}{8}$ from $\frac{1}{12}$. 25. $\frac{5}{6}$ from $\frac{1}{24}$.

14. $\frac{2}{5}$ from $\frac{7}{8}$. 20. $\frac{8}{9}$ from $\frac{1}{12}$. 26. $\frac{7}{9}$ from $\frac{7}{8}$.

27. A man owned $\frac{5}{6}$ of a farm and sold $\frac{1}{4}$ of the farm. How much did he still own?

28. Of a pole $\frac{1}{3}$ is in the air, $\frac{1}{4}$ is in the water, and the remainder is in the mud. What part of the pole is in the mud?

29. The difference between $\frac{1}{2}$ of John's marbles and $\frac{1}{3}$ of them is 10. How many marbles has he?

30. My age 10 years ago was equal to $\frac{3}{4}$ of my age now. How old am I?

31. I owe $\frac{3}{4}$ of a dollar. How much change should I get from $\frac{3}{4}$ of a dollar if I pay the debt?

32. A man bought $\frac{4}{5}$ of a farm and sold $\frac{3}{5}$ of the farm. What remained unsold was worth \$2000. What was the value of the farm?

33. In an orchard $\frac{1}{4}$ of the trees are peach trees, $\frac{1}{5}$ are pear trees, and the rest are apple trees. What part of the trees are apple trees?

34. If A bought a watch for $\frac{3}{4}$ of \$90, and sold it for $\frac{4}{5}$ of \$90, how much did he gain?

35. A boy who has 48 marbles loses $\frac{3}{8}$ of them and then buys $\frac{3}{4}$ as many as he had at first. How many has he then?

36. A paid \$150 for a horse and $\frac{3}{8}$ as much for a sleigh. He then sold them both for $\frac{4}{5}$ of the cost of both. How much did he lose?

What is the value of:

- | | | |
|--|---|--|
| 37. $\frac{1}{2} + \frac{1}{3} - \frac{1}{4}$? | 44. $\frac{7}{8} + \frac{5}{12} - \frac{2}{3}$? | 51. $\frac{7}{8} - \frac{3}{4} + \frac{7}{12}$? |
| 38. $\frac{1}{3} + \frac{1}{4} - \frac{1}{6}$? | 45. $\frac{3}{5} - \frac{1}{10} + \frac{2}{15}$? | 52. $\frac{5}{6} + \frac{3}{8} - \frac{7}{12}$? |
| 39. $\frac{2}{3} + \frac{1}{2} - \frac{3}{4}$? | 46. $\frac{5}{8} - \frac{1}{3} + \frac{5}{12}$? | 53. $\frac{4}{5} - \frac{3}{8} - \frac{1}{15}$? |
| 40. $\frac{3}{4} + \frac{4}{5} - \frac{9}{10}$? | 47. $\frac{5}{16} + \frac{3}{8} - \frac{1}{4}$? | 54. $\frac{5}{8} + \frac{7}{12} - \frac{9}{16}$? |
| 41. $\frac{4}{5} + \frac{1}{2} - \frac{3}{5}$? | 48. $\frac{3}{4} - \frac{7}{16} + \frac{3}{8}$? | 55. $\frac{7}{8} - \frac{4}{5} + \frac{3}{10}$? |
| 42. $\frac{5}{6} - \frac{3}{4} + \frac{1}{2}$? | 49. $\frac{3}{5} + \frac{5}{10} - \frac{2}{15}$? | 56. $1\frac{1}{8} + 3\frac{3}{8} - 1\frac{3}{4}$? |
| 43. $\frac{5}{6} + \frac{2}{3} - \frac{1}{6}$? | 50. $\frac{4}{7} + \frac{3}{14} - \frac{5}{28}$? | 57. $4\frac{5}{7} - 2\frac{1}{2} + 3\frac{4}{7}$? |

58. $9\frac{5}{8} - 4\frac{1}{2} + 6\frac{1}{8}?$

63. $8\frac{3}{8} - 5\frac{1}{4} + 6\frac{5}{16}?$

59. $12\frac{3}{8} + 5\frac{3}{8} - 6\frac{3}{8}?$

64. $9\frac{5}{8} - 4\frac{5}{12} + 5\frac{1}{3}?$

60. $21\frac{1}{8} + 3\frac{3}{4} - 10\frac{3}{8}?$

65. $4\frac{7}{8} - 2\frac{3}{4} + 8\frac{1}{2}?$

61. $8\frac{1}{5} + 2\frac{3}{10} - 4\frac{1}{20}?$

66. $8\frac{3}{4} - 4\frac{7}{8} + 3\frac{1}{8}?$

62. $7\frac{3}{8} + 5\frac{1}{8} - 3\frac{1}{12}?$

67. $10\frac{5}{8} + 3\frac{1}{2} - 7\frac{5}{16}?$

68. Find the value of $5\frac{1}{3} - 3\frac{2}{3}$.

SOLUTION:— $5\frac{1}{3} = 5\frac{4}{12}$; $3\frac{2}{3} = 3\frac{8}{12}$; $\frac{4}{12} = \frac{1}{3}$, and $\frac{8}{12} = \frac{2}{3}$; $\frac{1}{3} - \frac{2}{3} = -\frac{1}{3} = 1\frac{2}{3}$. Therefore the value of $5\frac{1}{3} - 3\frac{2}{3}$ is $1\frac{2}{3}$. Or,

$5\frac{1}{3} = 5\frac{4}{12}$ and $3\frac{2}{3} = 3\frac{8}{12}$. Therefore we are to find the difference between $5\frac{4}{12}$ and $3\frac{8}{12}$.

Since $\frac{4}{12}$ cannot be subtracted from $\frac{8}{12}$, a unit or $1\frac{1}{3}$ is taken from 5 and united with $\frac{4}{12}$, making $\frac{16}{12}$. The minuend is now equal to $4\frac{16}{12}$, and if $3\frac{8}{12}$ is subtracted from it, there is a remainder of $1\frac{8}{12}$. Therefore, etc.

NOTE.—It is usually advisable to subtract integers and mixed numbers separately.

Find the value of:

69. $6\frac{1}{4} - 3\frac{1}{2}$.

75. $4\frac{3}{8} - 2\frac{3}{4}$.

81. $4\frac{1}{10} - 3\frac{1}{2}$.

70. $4\frac{1}{2} - 3\frac{1}{4}$.

76. $3\frac{1}{6} - 1\frac{3}{10}$.

82. $3\frac{5}{8} - 1\frac{3}{4}$.

71. $3\frac{1}{4} - 2\frac{1}{8}$.

77. $3\frac{3}{4} - 2\frac{1}{8}$.

83. $4\frac{1}{3} - 2\frac{3}{4}$.

72. $3\frac{1}{2} - 1\frac{3}{8}$.

78. $3\frac{3}{8} - 1\frac{1}{4}$.

84. $5\frac{1}{4} - 3\frac{5}{8}$.

73. $5\frac{3}{4} - 1\frac{5}{8}$.

79. $8\frac{1}{8} - 2\frac{3}{4}$.

85. $4\frac{2}{5} - 2\frac{3}{10}$.

74. $6\frac{1}{8} - 3\frac{3}{4}$.

80. $7\frac{3}{8} - 3\frac{1}{8}$.

86. $5\frac{3}{8} - 2\frac{3}{4}$.

28. 1. What is $\frac{2}{3}$ of $\frac{9}{10}$?

SOLUTION:— $\frac{1}{3}$ of $\frac{9}{10} = \frac{3}{10}$, and $\frac{2}{3}$ of $\frac{9}{10} = 2$ times $\frac{3}{10}$, or $\frac{6}{10}$, equal to $\frac{3}{5}$. Therefore, etc.

2. What is $\frac{2}{3}$ of $\frac{3}{5}$? of $\frac{6}{7}$? of $\frac{12}{13}$? of $\frac{15}{16}$? of $\frac{17}{18}$?

3. What is $\frac{3}{4}$ of $\frac{4}{5}$? of $\frac{5}{6}$? of $\frac{6}{7}$? of $\frac{7}{8}$? of $\frac{8}{9}$? of $\frac{9}{10}$?

4. What is $\frac{2}{3}$ of $\frac{5}{6}$? of $\frac{5}{7}$? of $\frac{5}{8}$? of $\frac{10}{11}$? of $\frac{10}{12}$?

5. What is $\frac{2}{3}$ of $2\frac{1}{4}$?

SOLUTION:— $2\frac{1}{4} = \frac{9}{4}$; $\frac{1}{4}$ of $\frac{9}{4} = \frac{9}{16}$; and $\frac{2}{3}$ of $\frac{9}{4} = 2$ times $\frac{9}{16}$ or $\frac{9}{8}$, equal to $1\frac{1}{8}$. Therefore, $\frac{2}{3}$ of $2\frac{1}{4} = 1\frac{1}{8}$.

What is the value of:

6. $\frac{2}{3}$ of $1\frac{1}{5}$? of $1\frac{2}{5}$? of $4\frac{1}{2}$? of $2\frac{2}{5}$? of $3\frac{3}{4}$?

7. $\frac{3}{4}$ of $2\frac{2}{3}$? of $1\frac{2}{3}$? of $2\frac{2}{3}$? of $3\frac{1}{2}$? of $5\frac{1}{2}$?

8. $\frac{4}{5}$ of $1\frac{2}{3}$? of $3\frac{2}{3}$? of $3\frac{3}{4}$? of $11\frac{2}{3}$? of $7\frac{1}{2}$?

9. $\frac{5}{8}$ of $4\frac{1}{5}$? of $10\frac{2}{3}$? of $9\frac{2}{3}$? of $6\frac{2}{3}$? of $4\frac{4}{7}$?

10. A man had $3\frac{2}{5}$ tons of coal and burned $\frac{5}{8}$ of it. How much did he burn?

11. William traveled $\frac{3}{4}$ of $6\frac{2}{5}$ miles per hour. What was his rate per hour?

12. A dealer had $17\frac{1}{2}$ bushels of corn, and sold $\frac{3}{5}$ of it. How many bushels did he sell?

13. A lady had \$18 $\frac{3}{4}$ and paid $\frac{4}{5}$ of it for a dress. How much had she left?

14. If $\frac{5}{8}$ of \$19 $\frac{1}{2}$ is what was paid for a coat, how much did it cost?

15. If $\frac{5}{8}$ of a plot of ground containing $8\frac{2}{3}$ acres is sold for \$140, what is the price per acre?

16. What is $\frac{2}{3}$ of $\frac{4}{5}$?

SOLUTION:— $\frac{1}{5}$ of $\frac{4}{5} = \frac{4}{25}$, and $\frac{2}{3}$ of $\frac{4}{5} = 2$ times $\frac{4}{25}$, or $\frac{8}{25}$. Therefore, etc.

17. What is $\frac{2}{3}$ of $\frac{5}{8}$? of $\frac{1}{2}$? of $\frac{4}{7}$? of $\frac{5}{6}$? of $\frac{8}{9}$?

18. What is $\frac{3}{4}$ of $\frac{2}{3}$? of $\frac{1}{2}$? of $\frac{5}{6}$? of $\frac{7}{8}$? of $\frac{8}{9}$?

19. What is $\frac{4}{5}$ of $\frac{3}{4}$? of $\frac{2}{3}$? of $\frac{5}{6}$? of $\frac{7}{8}$? of $\frac{8}{9}$?

What is the value of:

- | | | |
|--------------------------------------|---------------------------------------|---------------------------------------|
| 20. $\frac{5}{8}$ of $\frac{4}{5}$? | 23. $\frac{5}{7}$ of $\frac{3}{4}$? | 26. $\frac{3}{4}$ of $1\frac{2}{3}$? |
| 21. $\frac{7}{8}$ of $\frac{3}{4}$? | 24. $\frac{3}{4}$ of $\frac{3}{2}$? | 27. $\frac{4}{5}$ of $2\frac{1}{3}$? |
| 22. $\frac{3}{5}$ of $\frac{7}{5}$? | 25. $\frac{3}{8}$ of $1\frac{1}{8}$? | 28. $\frac{5}{8}$ of $7\frac{1}{2}$? |

29. A man had $12\frac{1}{2}$ tons of coal in his cellar. He used $\frac{3}{8}$ of it in his furnace. How many tons did he use?

30. If a merchant sells $\frac{2}{5}$ of a piece of cloth containing $33\frac{1}{3}$ yards at 60 cents a yard, how much does he get for it?

31. A man owned $\frac{3}{4}$ of a mill and sold $\frac{2}{3}$ of his share for \$3000. At that rate, what was the mill worth?

32. A suit of clothes was sold for \$25 $\frac{1}{2}$. If it cost $\frac{2}{3}$ of the selling price, how much did it cost?

33. A boat went $18\frac{3}{4}$ miles down the river. If the current carried it $\frac{1}{5}$ of the distance and it was rowed the rest of the way, how far was it rowed?

34. A merchant bought $\frac{5}{8}$ of a stock of brooms and sold, at the same rate, $\frac{3}{5}$ of what he bought. How much did he get for them if the whole stock was worth \$120?

35. A boy gathered $\frac{3}{4}$ of a bushel of chestnuts, and sold $\frac{3}{4}$ of them. How much did he get for what he sold if he was paid at the rate of \$4.80 per bushel?

36. A grocer made a mixture of Mocha and Java coffee such that $\frac{7}{5}$ of it was Java. How many pounds were there of each if the whole weighed $15\frac{3}{4}$ pounds?

37. Henry inherited $\frac{3}{4}$ of an estate valued at \$10,000 and paid $\frac{2}{3}$ of his inheritance for 20 lots. How much did he pay for each lot?

29. 1. How much is 5 times $\frac{2}{3}$? $\frac{3}{4}$? $\frac{4}{5}$? $\frac{5}{6}$? $\frac{6}{7}$?
 2. How much is 4 times $\frac{3}{4}$? $\frac{1}{2}$? $\frac{5}{6}$? $\frac{2}{3}$? $\frac{4}{5}$? $\frac{5}{6}$?
 3. How much is 3 times $\frac{2}{3}$? $\frac{5}{6}$? $\frac{2}{3}$? $\frac{5}{12}$? $\frac{7}{10}$? $\frac{8}{11}$?
 4. What is the difference between $\frac{2}{3}$ of 4 and 4 times $\frac{2}{3}$?
 5. How much is $\frac{4}{5}$ of 12? of 15? of 6? of 8? of 20?
 6. How much is 6 times $\frac{2}{3}$? $\frac{3}{4}$? $\frac{4}{5}$? $\frac{5}{6}$? $\frac{6}{7}$? $\frac{7}{8}$?
 7. Multiply $4\frac{2}{3}$ by 5.
- SOLUTION:—5 times $\frac{2}{3} = \frac{10}{3}$, or $3\frac{1}{3}$; 5 times 4 = 20; and $20 + 3\frac{1}{3} = 23\frac{1}{3}$. Therefore $4\frac{2}{3} \times 5 = 23\frac{1}{3}$.
8. What is the value of $4\frac{1}{2} \times 5$? of $6\frac{2}{3} \times 4$? of $4\frac{3}{5} \times 3$? of $7\frac{3}{4} \times 5$? of $6\frac{2}{5} \times 7$? of $8\frac{2}{3} \times 8$? of $5\frac{4}{5} \times 9$?
 9. How much is 6 times $4\frac{2}{3}$? 7 times $3\frac{3}{4}$? 4 times $5\frac{2}{3}$? 8 times $3\frac{2}{3}$? 4 times $9\frac{2}{3}$? 5 times $5\frac{5}{6}$? 9 times $3\frac{1}{4}$?
 10. How much is 5 times $5\frac{1}{4}$? 4 times $9\frac{2}{3}$? 6 times $7\frac{1}{2}$? 7 times $7\frac{2}{3}$? 8 times $3\frac{2}{3}$? 9 times $7\frac{2}{3}$? 6 times $8\frac{2}{3}$?

What is the product of:

- | | | |
|--------------------------------|--------------------------------|---------------------------------|
| 11. $4\frac{1}{2} \times 12$? | 16. $8\frac{1}{2} \times 7$? | 21. $8 \times 7\frac{2}{3}$? |
| 12. $6\frac{2}{3} \times 10$? | 17. $9\frac{2}{3} \times 8$? | 22. $9 \times 6\frac{4}{5}$? |
| 13. $5\frac{4}{5} \times 6$? | 18. $7\frac{2}{3} \times 6$? | 23. $10 \times 3\frac{5}{6}$? |
| 14. $8 \times 7\frac{2}{3}$? | 19. $9\frac{2}{10} \times 9$? | 24. $12 \times 4\frac{4}{5}$? |
| 15. $12\frac{2}{3} \times 3$? | 20. $6\frac{4}{7} \times 6$? | 25. $11 \times 3\frac{2}{10}$? |
26. Irene bought $8\frac{3}{4}$ yards of ribbon at 12 cents a yard. How much did it cost her?
 27. At $6\frac{1}{4}$ cents a pound, how much will 8 pounds of rice cost?
 28. When butter costs $18\frac{3}{4}$ cents a pound, how much will 12 pounds cost?

29. How far can a man walk in 10 hours, who goes $3\frac{3}{4}$ miles per hour?

30. A man proposes to ride 100 miles. How far has he yet to go after he has ridden 7 hours at $11\frac{3}{4}$ miles per hour?

31. How much must I pay for $9\frac{1}{2}$ tons of hay at \$8 per ton?

32. A farmer sold his apples in barrels, each containing $2\frac{3}{4}$ bushels, at 60 cents per bushel. How much did he get for them per barrel?

33. How much will a farm of 160 acres of wild land cost at \$ $2\frac{1}{4}$ per acre?

34. What will be the cost of $5\frac{3}{4}$ gallons of sirup at 60 cents per gallon?

35. Mary bought at one time $5\frac{3}{8}$ yards of ribbon and at another $6\frac{3}{4}$ yards. How much did it all cost her at 12 cents per yard?

36. How much change should I receive out of a five-dollar bill if I pay for 12 bushels of corn at \$ $\frac{3}{8}$ per bushel?

37. Two men travel in opposite directions, one at the rate of $3\frac{1}{2}$ miles an hour, and the other at the rate of $4\frac{1}{2}$ miles an hour. How far apart are they in 12 hours?

38. I bought 12 cords of hard wood at \$ $8\frac{1}{2}$ per cord and $5\frac{1}{2}$ tons of coal at \$5 per ton. How much did my fuel cost?

39. What is the cost of $8\frac{3}{4}$ pounds of cheese at 12 cents a pound and $7\frac{1}{2}$ pounds of butter at 20 cents a pound?

30. 1. How much is $3\frac{1}{2}$ times $4\frac{2}{3}$?

SOLUTION:— $3\frac{1}{2} = \frac{7}{2}$; $4\frac{2}{3} = \frac{14}{3}$. $\frac{1}{2}$ of $\frac{14}{3} = \frac{7}{3}$, or $2\frac{1}{3}$, and $\frac{1}{2}$ of $\frac{14}{3} = 7$ times $\frac{1}{3}$, or $\frac{7}{3}$, which is equal to $16\frac{2}{3}$. Therefore, etc.

2. How much is $2\frac{1}{2}$ times $\frac{3}{4}$? $3\frac{1}{3}$ times $1\frac{1}{2}$? $8\frac{1}{2}$ times $\frac{2}{3}$? $4\frac{3}{4}$ times $2\frac{3}{8}$?

3. What is the product of $\frac{2}{3} \times 4\frac{1}{2}$? of $\frac{3}{4} \times 2\frac{3}{8}$? of $6\frac{1}{2} \times 3\frac{1}{2}$? of $8\frac{1}{3} \times 2\frac{2}{5}$?

4. How much is $4\frac{1}{2}$ times $2\frac{1}{3}$? $6\frac{2}{3}$ times $2\frac{1}{3}$? $12\frac{1}{2}$ times $1\frac{1}{2}$? $7\frac{1}{3}$ times $3\frac{1}{3}$?

What is the value of:

5. $7\frac{1}{2} \times 6\frac{2}{3}$? 11. $5\frac{1}{3} \times 2\frac{1}{4}$? 17. $\frac{1}{2}$ of $\frac{3}{4}$ of 12?

6. $4\frac{2}{3} \times 1\frac{1}{2}$? 12. $12\frac{2}{3} \times 3\frac{1}{2}$? 18. $\frac{2}{3}$ of $\frac{4}{5}$ of 15?

7. $13\frac{1}{3} \times 5\frac{1}{4}$? 13. $15\frac{2}{3} \times 1\frac{1}{3}$? 19. $\frac{3}{4}$ of $\frac{4}{5}$ of $18\frac{2}{3}$?

8. $6\frac{1}{4} \times 2\frac{3}{8}$? 14. $11\frac{2}{3} \times 2\frac{1}{7}$? 20. $\frac{4}{5}$ of $\frac{5}{6}$ of $7\frac{1}{6}$?

9. $8\frac{1}{3} \times 3\frac{2}{5}$? 15. $10\frac{4}{5} \times 3\frac{1}{3}$? 21. $\frac{5}{6}$ of $\frac{1}{2}$ of $8\frac{2}{3}$?

10. $16\frac{2}{3} \times 4\frac{1}{2}$? 16. $7\frac{1}{7} \times 2\frac{4}{5}$? 22. $\frac{4}{5}$ of $\frac{3}{4}$ of 60?

23. A man walked $8\frac{1}{3}$ hours at the rate of $3\frac{2}{3}$ miles per hour. How far did he go?

24. How much will 9 dozen eggs cost at $12\frac{1}{2}$ cents per dozen?

25. If a horse eats $1\frac{1}{2}$ tons of hay per month, how much will the hay for $3\frac{1}{2}$ months cost, at \$20 per ton?

26. If a box of oranges costs \$3 $\frac{3}{4}$, how much will 5 $\frac{1}{3}$ boxes cost?

27. If a man earns \$2 $\frac{3}{4}$ per day, how much does he earn in $3\frac{1}{2}$ days?

28. A grocer sold $18\frac{2}{3}$ barrels of apples at \$2 $\frac{3}{4}$ per barrel. How much did he get for them?

29. A lady bought 15 yards of silk at $\$1\frac{1}{4}$ per yard. How much did it cost her?

30. I bought $6\frac{1}{4}$ cords of wood at $\$4\frac{1}{5}$ per cord, and paid for it in rye at 50 cents a bushel. How many bushels were required to pay the bill?

31. How many times 8 is the product of $13\frac{1}{8}$ by $4\frac{1}{2}$?

32. Jane is $6\frac{3}{4}$ years old, and her mother is $5\frac{1}{2}$ times as old. How old is her mother?

33. John earns $\$1\frac{1}{4}$ per day, and his father earns $3\frac{1}{2}$ times as much. How much does each earn in 8 days?

34. If coal is $\$4\frac{2}{5}$ a ton, and wood is $1\frac{1}{2}$ times as dear, what is the cost of 10 tons of coal and 10 cords of wood?

35. One bushel of wheat is worth $2\frac{1}{2}$ bushels of corn. How much corn are $7\frac{1}{2}$ bushels of wheat worth?

36. A man who owned $\frac{5}{8}$ of a field containing $13\frac{1}{8}$ acres, sold $\frac{3}{5}$ of what he owned. How much did he sell?

37. A man who gets $\$16\frac{2}{3}$ per week has his salary advanced to $1\frac{1}{5}$ times that sum. How much does he then receive per week?

38. If a man can hoe $\frac{7}{8}$ of an acre of potatoes in a day, how many acres can he hoe in $8\frac{1}{5}$ days?

39. If an acre of land produces 45 bushels of corn, how much will $2\frac{2}{3}$ acres produce?

40. What will be the cost of $\frac{3}{4}$ of a piece of cloth containing $12\frac{1}{4}$ yards, at $\$3\frac{1}{2}$ per yard?

31. 1. How many times is $\frac{2}{3}$ contained in 2?

SOLUTION:—2 is equal to $\frac{6}{3}$; $\frac{2}{3}$ is contained in $\frac{6}{3}$, 3 times.

Or, $\frac{2}{3}$ is contained in 1 *three* times, and in 2 *six* times. Hence $\frac{2}{3}$ is contained in 2 one half of 6 times or 3 times. Therefore, etc.

2. How many times is $\frac{1}{2}$ contained in 1? in 3? in 2? in 5? in 8? in 7? in 12?

3. How many times is $\frac{1}{3}$ contained in 6? in 4? in 7? in 8? in 24? in 15? in 11? in 10?

4. How many times is $\frac{3}{4}$ contained in 4? in 2? in 6? in 9? in 3? in 10? in 7?

5. Divide 4 by $\frac{3}{4}$; by $\frac{2}{3}$; by $\frac{5}{6}$; by $\frac{1}{2}$; by $\frac{1}{3}$; by $\frac{2}{5}$.

6. Divide 5 by $1\frac{1}{2}$; by $2\frac{1}{3}$; by $1\frac{2}{5}$; by $1\frac{3}{4}$; by $3\frac{2}{3}$; by $2\frac{1}{4}$.

7. If I burn $\frac{2}{3}$ of a ton of coal per month, how long will 6 tons last?

8. When $\$ \frac{2}{3}$ a pound is charged for coffee, how many pounds can be bought for \$3?

9. A man can plow $\frac{5}{8}$ of an acre of ground in a day. How long will it take him to plow a field of 10 acres?

10. At $\$ \frac{3}{4}$ per pound, how many pounds of tea can be bought for \$9?

11. If a lady pays $\$ \frac{4}{5}$ for one yard of velvet, how many yards can she buy for \$8?

12. Divide $\frac{4}{5}$ into 3 equal parts; that is, divide $\frac{4}{5}$ by 3.

SOLUTION:—Since $\frac{4}{5}$ is to be divided into 3 equal parts, each part will be $\frac{1}{3}$ of $\frac{4}{5}$, which is $\frac{4}{15}$.

Or, to divide a number by 3 is to find $\frac{1}{3}$ of it; therefore to divide $\frac{4}{5}$ by 3 is to find $\frac{1}{3}$ of $\frac{4}{5}$, which is $\frac{4}{15}$. Therefore, etc.

13. How many times is 2 contained in $\frac{2}{3}$? in $\frac{2}{5}$? in $\frac{2}{7}$? in $\frac{10}{8}$? in $\frac{12}{16}$? in $\frac{8}{11}$? in $\frac{1}{4}$?

14. How many times is 3 contained in $\frac{2}{7}$? in $\frac{2}{5}$? in $\frac{2}{10}$? in $\frac{12}{8}$? in $\frac{2}{7}$? in $\frac{12}{8}$? in $\frac{1}{6}$? in $\frac{2}{12}$?

15. Divide $\frac{4}{5}$ by 2; by 4; by 3; by 5; by 8; by 6.

16. Divide $\frac{2}{4}$ by 3; by 2; by 4; by 7; by 9; by 5.

17. Divide $1\frac{2}{3}$ by 5; by 8; by 10; by 4; by 3.

18. A man divided $\frac{2}{3}$ of an acre of land into 3 lots. What part of an acre did each contain?

19. If 4 books cost $\$1\frac{1}{5}$, how much did each cost?

20. If $\frac{7}{8}$ of a barrel of flour is divided equally among 3 families, how much will each family receive?

21. $\$ \frac{2}{4}$ was divided equally among 5 boys. What part of a dollar did each receive?

22. A man gave each of his 5 sons an equal share of $\frac{1}{4}$ of his estate. What part of the whole did each receive?

23. How many times is $\frac{2}{3}$ contained in $\frac{2}{4}$?

SOLUTION: — $\frac{2}{3} = \frac{2}{12}$, and $\frac{2}{4} = \frac{6}{12}$. $\frac{2}{12}$ is contained in $\frac{6}{12}$, $\frac{2}{3}$ or $1\frac{1}{2}$ times.

Or, $\frac{2}{3}$ is contained in 1 three times, and $\frac{2}{4}$ is contained in 1 one half of three times, or $\frac{3}{2}$ times. Since $\frac{2}{3}$ is contained in 1, $\frac{2}{3}$ times, in $\frac{2}{4}$ it will be contained $\frac{2}{3}$ of $\frac{3}{2}$ times, or $\frac{2}{3}$ or $1\frac{1}{2}$ times. Therefore $\frac{2}{3}$ is contained in $\frac{2}{4}$, $1\frac{1}{2}$ times.

24. How many times is $\frac{1}{4}$ contained in $\frac{1}{2}$? $\frac{1}{8}$ in $\frac{1}{4}$? $\frac{2}{3}$ in $\frac{2}{4}$? $\frac{2}{3}$ in $\frac{5}{6}$? $\frac{2}{3}$ in $\frac{7}{10}$?

25. How many times is $\frac{2}{3}$ contained in $\frac{1}{5}$? in $\frac{4}{5}$? in $\frac{7}{8}$? in $\frac{5}{6}$? in $\frac{2}{10}$? in $\frac{2}{8}$? in $\frac{1}{12}$?

26. How many times is $\frac{2}{3}$ contained in $\frac{1}{2}$? in $\frac{2}{3}$? in $\frac{2}{7}$? in $\frac{6}{15}$? in $\frac{10}{18}$? in $\frac{2}{4}$? in $\frac{2}{6}$? in $\frac{1}{11}$?

27. How many times is $\frac{1}{4}$ contained in $2\frac{1}{2}$? in $4\frac{1}{2}$? in $7\frac{1}{2}$? in $8\frac{1}{2}$? in $6\frac{1}{2}$? in $8\frac{1}{2}$? in $5\frac{1}{2}$?

28. Divide $\frac{7}{8}$ by $\frac{1}{4}$; by $\frac{3}{8}$; by $\frac{9}{11}$; by $\frac{5}{7}$; by $\frac{4}{5}$.

29. Divide $2\frac{1}{4}$ by $\frac{3}{8}$; by $1\frac{1}{4}$; by $9\frac{1}{8}$; by $2\frac{3}{8}$; by $2\frac{1}{8}$.

30. At $\$ \frac{2}{5}$ a pound, how many pounds of tea can be bought for $\$ \frac{3}{4}$?

31. If $\frac{2}{5}$ of a box of figs cost $\$ \frac{7}{8}$, how much will 1 box cost?

32. How many times will $5\frac{1}{4}$ gallons of kerosene fill a can that holds $\frac{1}{8}$ of a gallon?

33. At $\$ \frac{2}{15}$ a yard, how many yards of cambric can be bought for $\$ \frac{7}{8}$?

34. If a man chops $1\frac{1}{8}$ cords of wood in a day, how many days will it take him to chop $2\frac{3}{4}$ cords?

Find the value of :

35. $\frac{2}{7} + 6$.

45. $\frac{7}{10} \div 8$.

55. $7 \div \frac{5}{8}$.

36. $1\frac{5}{8} + 5$.

46. $1\frac{1}{2} \div 6$.

56. $1\frac{2}{10} + \frac{2}{5}$.

37. $9\frac{1}{5} + 5$.

47. $4\frac{3}{8} + 7$.

57. $24 + 3\frac{1}{2}$.

38. $63 \div \frac{2}{7}$.

48. $\frac{6}{7} \div \frac{3}{8}$.

58. $10 \div \frac{6}{7}$.

39. $\frac{2}{10} \div \frac{3}{8}$.

49. $2\frac{5}{8} \div \frac{7}{8}$.

59. $\frac{3}{8} + 4$.

40. $\frac{4}{7} \div \frac{2}{3}$.

50. $2\frac{4}{5} \div 7$.

60. $1\frac{2}{7} \div 6$.

41. $2\frac{3}{8} + 3\frac{1}{2}$.

51. $9 \div \frac{5}{8}$.

61. $\frac{1}{2}$ of $\frac{2}{5} + \frac{3}{4}$.

42. $\frac{2}{3} \div 8$.

52. $5\frac{1}{2} + 1\frac{1}{8}$.

62. $\frac{7}{8} \div \frac{2}{3}$ of $\frac{3}{4}$.

43. $18 \div \frac{2}{3}$.

53. $\frac{2}{10} \div \frac{2}{5}$.

63. $\frac{2}{7}$ of $1\frac{2}{5} \div \frac{5}{8}$.

44. $\frac{4}{7} \div \frac{3}{4}$.

54. $16\frac{3}{8} \div 10$.

64. $2\frac{3}{8} \div \frac{1}{2}$ of $1\frac{3}{4}$.

65. If one fish weighs $1\frac{1}{2}$ pounds, how many such fish will weigh $10\frac{1}{2}$ pounds?

66. At $\$ \frac{4}{5}$ per bushel for barley, how many bushels can be bought for $\$20$?

67. How much does one pound of sugar cost, if 6 pounds cost $\$1 \frac{1}{5}$?

68. If 3 apples cost 4 cents, how many apples can be bought for 16 cents?

69. How many dozen writing books at $\$ \frac{3}{4}$ per dozen can be bought for $\$7 \frac{1}{2}$?

70. At $\$ \frac{1}{12}$ per pound, how much rice can be bought for $\$2 \frac{1}{2}$?

71. If $\$13 \frac{1}{2}$ is paid for $2 \frac{1}{4}$ dozen handkerchiefs, how much does one handkerchief cost?

72. How many bushels of apples can be bought for $\$22$ at $1 \frac{3}{4}$ dollars a bushel?

73. A man walked 16 miles in $3 \frac{1}{5}$ hours. What was his rate per hour?

74. If a man gets $\$3 \frac{1}{5}$ per day, and saves $\frac{3}{5}$ of it, how long will it take him to save $\$30$?

75. If a piece of work can be done by one man in $9 \frac{1}{2}$ days, how long will it take 4 men to do it?

76. If $3 \frac{2}{3}$ times a certain number is $6 \frac{2}{3}$, what is the number?

77. How far can a man travel in $4 \frac{3}{4}$ hours, if he goes $10 \frac{3}{8}$ miles in $2 \frac{3}{8}$ hours?

78. A lady paid $\$16 \frac{1}{5}$ for a dress, and this sum was $4 \frac{1}{2}$ times as much as she had left. How much had she at first?

79. After reading $\frac{3}{7}$ of a book there are 160 pages unread. How many pages are there in the book?

80. What is the circumference of a wheel that turns $3\frac{3}{4}$ times in going 45 feet?

81. A horse was sold for \$175, which was $1\frac{1}{5}$ times what he cost. How much did he cost?

82. A grocer sells $1\frac{3}{8}$ pounds of butter for what 2 pounds cost him. How much does he pay for it per pound, if he sells it at 24 cents a pound?

83. If a dairyman can make $3\frac{1}{2}$ pounds of cheese from $15\frac{3}{4}$ quarts of milk, how much milk will yield a pound of cheese?

84. How much will 4 oranges cost if 10 oranges cost 25 cents?

85. When you can get 15 eggs for 25 cents, how much will a dozen cost?

86. If eggs at $\$ \frac{1}{5}$ a dozen are exchanged for potatoes at $\$ \frac{5}{8}$ a bushel, how many eggs will pay for 16 bushels of potatoes?

87. If 3 men can do a piece of work in $4\frac{1}{2}$ days, how long will it take 1 man to do it? How long will it take 7 men?

88. If $3\frac{1}{2}$ pounds of rice cost 25 cents, how much will 1 pound cost? How much will 14 pounds cost?

89. A gallon of cider cost $\$ \frac{1}{4}$. How much cider can be bought for $\$ 1\frac{1}{5}$?

90. How far can a man walk in 10 hours whose rate of walking is 10 miles in $3\frac{1}{3}$ hours?

91. If a horse eats $\frac{3}{4}$ of a bushel of oats in a day, in how many days will he eat 9 bushels?

32. 1. After a boy lost $\frac{3}{7}$ of his marbles, he had 36 left. How many had he at first?

2. A man owned $\frac{3}{8}$ of a mill, and sold $\frac{3}{8}$ of his share for \$6000. What was the value of the mill?

3. When I have paid my grocer $\frac{2}{3}$ of his bill, I still owe him \$48. What is his entire bill?

4. If milk is worth $\frac{3}{10}$ as much as cream, how much is cream worth when milk is 6 cents a quart?

5. A boy sold $\frac{3}{8}$ of the chestnuts he had gathered. The amount he received was \$3 $\frac{3}{8}$. How much were they all worth at the same rate?

6. If $\frac{2}{3}$ of a bushel of apples is worth $\frac{3}{4}$ of a bushel of peaches, how much are peaches worth when apples are 90 cents a bushel?

7. If $\frac{1}{2}$ of $\frac{2}{3}$ of a number is 60, what is the number?

8. The difference between $\frac{3}{4}$ of a number and $\frac{3}{8}$ of it is 120. What is the number?

9. For 4 $\frac{3}{4}$ pounds of meat I pay 22 cents more than for 3 $\frac{3}{4}$ pounds. How much is it per pound?

10. A barrel of oil was sold for \$9, which was 1 $\frac{2}{3}$ times its cost. How much did it cost?

11. A plot of ground contains 18 $\frac{3}{4}$ square rods. If \$225 was paid for $\frac{3}{8}$ of it, how much was that per rod?

12. A conductor gets 64 cents for a trip of 2 $\frac{3}{4}$ hours. At what rate is he paid per hour?

13. If a horse was sold for $\frac{7}{8}$ of his cost, what was the cost of the horse if the selling price was \$196?

14. If $\frac{2}{3}$ of a cord of wood costs \$2 $\frac{2}{3}$, how much must be paid for 5 cords?

15. If 3 yards of cloth cost $\$4\frac{1}{2}$, how many yards can be bought for $\$14$?

16. A farmer fed $4\frac{1}{2}$ bushels of oats to 2 horses in 3 days. How much did each horse eat daily?

17. How many suits of $3\frac{3}{4}$ yards each can be cut from a piece of cloth containing 45 yards?

18. A is 45 miles ahead of B, and travels 9 miles per hour. If B travels $1\frac{1}{2}$ times as fast as A, in how many hours will B overtake A?

19. If 4 men can do a piece of work in $8\frac{2}{3}$ days, in how many days can 1 man do the same work? In how many days can 13 men do it?

20. After paying out $\frac{2}{5}$ of my money and $\frac{3}{8}$ of the remainder I had $\$20$ left. How much had I at first?

21. A man paid $\frac{3}{8}$ as much for his chain as for his watch. If they both together cost him $\$150$, how much did he pay for each?

22. If $\$10$ is paid for 3 yards of velvet, how much can be bought for $\$8$?

23. When 3 tons of coal cost as much as 5 cords of wood, how much per ton is coal if wood is $\$4\frac{1}{2}$ a cord?

24. If $\frac{1}{4}$ of A's age is added to $\frac{1}{3}$ of his age, the sum is 35 years. How old is he?

25. After a man has traveled 5 hours at the rate of $4\frac{1}{2}$ miles per hour, he has still $\frac{5}{8}$ of the distance to go to complete the journey. How far did he intend to go?

26. If I pay as much for 3 turkeys as for 7 chickens, how much are turkeys worth when 3 chickens cost $\$1\frac{1}{3}$?

27. If rice is sold for 7 cents a pound when it costs $\$8\frac{3}{4}$ a barrel, for how much should it be sold when it costs $\$11\frac{1}{4}$ a barrel?

28. If $3\frac{1}{4}$ acres produce $8\frac{1}{8}$ tons of hay, how many tons will 8 acres produce?

29. A horse travels 50 miles in $6\frac{2}{3}$ hours. How long will it take him to travel 40 miles?

30. If a horse eats $\frac{3}{8}$ of a ton of hay in $\frac{5}{8}$ of a month, how long will $2\frac{1}{2}$ tons last him?

31. A man expended $\frac{3}{8}$ of his money for a horse and $\frac{1}{4}$ as much for a carriage. He then had \$110 left. How much had he at first?

32. A lady bought some muslin, and later bought $1\frac{1}{2}$ times as much. She then used $\frac{3}{5}$ of all she had, and had 32 yards left. How much did she buy?

33. Gloves that cost $\$1\frac{3}{8}$ a pair were sold for $1\frac{1}{4}$ times their cost. How many pairs must be sold to gain \$22?

34. John earns $\$7\frac{1}{8}$ a day, and his father $1\frac{1}{2}$ times as much. In how many days can they together earn \$27?

35. If 4 horses eat $2\frac{3}{4}$ bushels of oats per day, how long will that quantity last 3 horses?

36. If a man can row a boat down stream at the rate of 8 miles an hour, and his rate of rowing up stream is $\frac{5}{8}$ of his rate down, how far can he row and return in 39 hours?

37. If $3\frac{1}{2}$ bushels of apples cost $\$5\frac{3}{8}$, how much will 5 bushels cost?

38. From $1\frac{1}{2}$ pounds of ham 20 sandwiches are made, and sold at 5 cents each. How much is received per pound for the ham if the bread and butter used are worth 25 cents?

39. A farmer paid $\frac{3}{4}$ of \$10 for clover seed at \$2 $\frac{1}{4}$ a bushel. How many bushels did he buy?

40. A grocer gave $1\frac{3}{4}$ gallons of molasses for 6 pounds of butter at $17\frac{1}{2}$ cents a pound. How much was the molasses worth per gallon?

41. A expends $\frac{2}{5}$ of his money, and then earns $\frac{1}{2}$ as much as he has left. He then has \$45. How much had he at first?

42. A and B ride from the same point in opposite directions, A at the rate of $13\frac{1}{2}$ miles in $1\frac{1}{2}$ hours, and B at the rate of $13\frac{1}{2}$ miles in $2\frac{3}{4}$ hours. How far apart will they be in 5 hours?

33. 1. 20 is $\frac{2}{3}$ of what number? 30? 24? 18? 50?

2. 24 is $\frac{3}{4}$ of what number? 36? 30? 27? 90? 60?

3. 40 is $\frac{4}{5}$ of what number? 48? 32? 16? 24? 120?

4. 28 is $\frac{4}{7}$ of what number? 36? 72? 24? 144?

5. 21 is $\frac{7}{5}$ of what number? 35? 49? 28? 42? 140?

6. 100 is $\frac{5}{8}$ of what number? 80? 75? 45? 65?

7. 50 is $\frac{10}{11}$ of what number? 70? 30? 90? 60?

8. 36 is $\frac{6}{7}$ of what number? 48? 72? 60? 42?

9. 48 is $\frac{8}{9}$ of what number? 64? 96? 72? 32?

10. 18 is $\frac{4}{5}$ of what number?

SOLUTION:—Since 18 is $\frac{4}{5}$ of a number, $\frac{1}{5}$ of the number is $1\frac{1}{4}$, and the number is 5 times $1\frac{1}{4}$, or $2\frac{1}{4}$, which is equal to 22 $\frac{1}{4}$. Therefore, etc.

11. 12 is $\frac{6}{5}$ of what number? 9? 6? 13? 16? 19?

12. 7 is $\frac{3}{8}$ of what number? 9? 11? 13? 19? 23?
13. 22 is $\frac{3}{8}$ of what number? 17? 11? 13? 40? 100?
14. 24 is $\frac{6}{8}$ of what number? 32? 17? 13? 22? 14?
15. 7 is $\frac{3}{8}$ of what number? 8? 13? 16? 20? 40?
16. 5 is $\frac{4}{7}$ of what number? 11? 4? 9? 13? 17?
17. 15 is $\frac{3}{8}$ of how many times 5?

SOLUTION:—Since 15 is $\frac{3}{8}$ of 25, it is $\frac{3}{8}$ of 5 times 5. Therefore, etc.

18. 24 is $\frac{3}{8}$ of how many times 6? 36? 60? 48? 12?
19. 24 is $\frac{3}{8}$ of how many times 5? 20? 36? 40? 50?
20. 9 is $\frac{3}{8}$ of how many times 4? 12? 24? 36? 18?
21. \$42 is $\frac{3}{8}$ of what I paid for wood at \$7 per cord. How many cords were there?
22. \$150 is $\frac{3}{8}$ the cost of some cattle at \$75 per head. How many cattle were there?
23. \$9 $\frac{3}{8}$ is $\frac{3}{8}$ of what was paid for 8 tons of coal. How much did it cost per ton?
24. A man paid \$18 $\frac{3}{4}$ for a cow, which was $\frac{5}{12}$ of what he paid for a horse. How much did the horse cost?
25. A man plowed 5 $\frac{1}{2}$ acres of ground at \$1 $\frac{1}{2}$ per acre, and what he received was $\frac{11}{12}$ of what he already had. How much money did he then have?
26. A man after traveling 3 days, averaging 30 $\frac{1}{8}$ miles per day, had accomplished only $\frac{7}{10}$ of his entire journey. How far had he yet to go?
27. A merchant was obliged to sell a piece of cloth for \$16 $\frac{4}{5}$, which was $\frac{4}{5}$ of what it cost him. How much did he lose?

28. A merchant sold 6 yards of silk at $\$3\frac{3}{4}$ per yard. What he received for it was $\frac{9}{10}$ of the value of what he had left at $\$3\frac{3}{4}$ per yard. How much had he left?

29. $\$18\frac{3}{4}$ is $\frac{3}{8}$ of what was paid for 3 tons of hay. How much was the hay per ton?

30. $10\frac{3}{8}$ yards of ribbon is $\frac{4}{5}$ of 8 times what Mary used to trim her dress. How much did it cost at 45 cents a yard?

31. $5\frac{5}{8}$ miles is $\frac{3}{8}$ of 6 times the distance John can travel in an hour. How far can he travel in an hour?

34. 1. $\frac{3}{4}$ of 12 is how many sevenths of 21?

SOLUTION:— $\frac{3}{4}$ of 12 = 9; and 9 is as many sevenths of 21 as $\frac{1}{7}$ of 21 is contained times in 9, which is 3. Therefore $\frac{3}{4}$ of 12 is $\frac{3}{7}$ of 21.

2. $\frac{5}{8}$ of 56 is how many fifths of 25?
3. $\frac{2}{3}$ of 24 is how many tenths of 40?
4. $\frac{5}{6}$ of 72 is how many sevenths of 28?
5. $\frac{3}{20}$ of 140 is how many fifths of 35?
6. $\frac{1}{12}$ of 75 is how many thirds of 33?
7. $\frac{3}{8}$ of $11\frac{1}{4}$ is how many sevenths of 21?
8. $\frac{2}{7}$ of $11\frac{2}{3}$ is how many sixths of 18?
9. $\frac{4}{7}$ of $17\frac{1}{2}$ is how many fifths of 25?
10. $\frac{5}{9}$ of $12\frac{2}{3}$ is how many halves of 14?
11. $\frac{3}{4}$ of $18\frac{3}{4}$ is how many thirds of 21?
12. $\frac{4}{5}$ of 30 is how many eighths of 64?
13. $\frac{5}{8}$ of $14\frac{3}{4}$ is how many fifths of 15?
14. $\frac{2}{3}$ of $9\frac{1}{6}$ is how many halves of 22?
15. $\frac{3}{8}$ of $9\frac{4}{5}$ is how many thirds of 51?

16. 6 times $33\frac{1}{2}$ is how many halves of 80?

17. $\frac{4}{5}$ of $20\frac{1}{4}$ is $\frac{2}{3}$ of what number?

SOLUTION: — $\frac{4}{5}$ of $20\frac{1}{4}$ = 9, and 9 is $\frac{2}{3}$ of 15. Therefore, etc.

18. $\frac{4}{5}$ of $18\frac{3}{4}$ is $\frac{5}{6}$ of what number?

19. $\frac{6}{7}$ of $33\frac{1}{2}$ is $\frac{2}{3}$ of what number?

20. $\frac{3}{4}$ of $22\frac{3}{4}$ is $\frac{2}{3}$ of what number?

21. $\frac{1}{11}$ of $15\frac{2}{3}$ is $\frac{2}{7}$ of what number?

22. $\frac{2}{3}$ of $7\frac{1}{2}$ is $\frac{1}{20}$ of what number?

23. $\frac{3}{5}$ of $16\frac{1}{4}$ is $\frac{1}{5}$ of what number?

24. $\frac{5}{4}$ of $13\frac{3}{4}$ is $\frac{2}{3}$ of what number?

25. $\frac{7}{8}$ of $13\frac{1}{2}$ is $\frac{2}{3}$ of what number?

26. $\frac{2}{5}$ of $4\frac{1}{2}$ yards of ribbon was $\frac{2}{3}$ of the number of yards of ribbon that Amy bought at 40 cents a yard. How much did it cost?

27. If $\frac{5}{4}$ of \$16 $\frac{1}{2}$ was $\frac{2}{3}$ of what a man paid for 4 tons of hay, how much was it per ton?

28. If $\frac{2}{7}$ of $5\frac{3}{4}$ miles is $\frac{2}{10}$ of the distance that John walked in 2 hours, what was his rate per hour?

29. If $1\frac{2}{3}$ times $7\frac{1}{2}$ miles is $\frac{2}{3}$ of the distance from A to B, how far is it?

30. If I paid $\frac{4}{5}$ of \$22 $\frac{1}{2}$ for $3\frac{2}{3}$ tons of coal, how much was it per ton?

35. 1. If I had twice as much money as I have, $\frac{5}{12}$ of it would be \$25. How much money have I?

2. If $\frac{2}{3}$ of $2\frac{1}{4}$ times the distance from New York to Philadelphia is 135 miles, what is the distance?

3. A farmer sold $\frac{2}{3}$ of his hay at \$15 a ton and received for it \$6. How much hay had he?

4. $\frac{3}{8}$ of a piece of ribbon was sold at 12 cents a yard, for 45 cents. How many yards of ribbon were there in the piece?

5. The list price of a piano was \$300. $\frac{2}{15}$ of this price is $\frac{3}{8}$ of the deduction that was made when it was sold. How much was received for it?

6. A man paid \$1200 for a lot; $\frac{2}{5}$ of $3\frac{1}{2}$ times the cost of the lot was $\frac{3}{8}$ of the cost of the house he built upon it. How much did the house cost?

7. The distance from New York to Chicago is approximately 1000 miles. $\frac{4}{5}$ of this distance is 4 times the distance from Boston to Albany. How far is it from Boston to Albany?

8. In a certain field there are 96 head of cattle; $\frac{2}{3}$ of the number of cattle is equal to $\frac{3}{8}$ of the number of acres of land in the field. What is the value of the field at \$100 per acre?

9. A man pays \$300 a year rent, and $\frac{4}{5}$ of this sum is $\frac{3}{8}$ of $\frac{1}{10}$ of his salary per year. What is his salary?

10. A man being asked his age said that $\frac{5}{6}$ of his age was $\frac{5}{6}$ of 40 years. How old was he?

11. How much must be paid for $3\frac{3}{4}$ tons of hay if $\frac{3}{8}$ of $3\frac{3}{4}$ tons cost \$37 $\frac{1}{2}$?

12. A boy expended $\frac{2}{5}$ of his money and then earned $\frac{3}{4}$ as much as he expended. He then had \$1 $\frac{1}{2}$. How much had he at first?

13. The goods in a store are worth \$2000. $\frac{4}{5}$ of their value is $\frac{3}{8}$ of twice the value of the store. What is the value of the store?

14. A hardware dealer sells lemon squeezers at \$27 per dozen. $\frac{2}{3}$ of this sum is $\frac{1}{2}$ of what they cost per dozen. What is his gain per dozen?

15. My age increased by $\frac{2}{3}$ of $2\frac{1}{2}$ times my age is 80 years. How old am I?

16. After a man has traveled $\frac{2}{3}$ of $\frac{3}{4}$ of the distance he has to go, he has still 25 miles to travel. What is the length of his journey?

17. A horse costs \$150, and $\frac{1}{5}$ of $\frac{2}{3}$ of this is the value of two cows. What are the cows worth apiece?

18. If a lemon costs $\frac{1}{2}$ as much as an orange, and a dozen of each cost together 54 cents, how much is each worth apiece?

19. If $\frac{2}{3}$ of $3\frac{3}{4}$ pounds of rice cost $\frac{3}{4}$ of $\frac{2}{3}$ of 40 cents, how much is rice per pound?

20. If $2\frac{2}{3}$ tons of coal cost $\frac{1}{2}$ of \$13 $\frac{1}{2}$, how much is that per ton?

36. 1. What part of 5 is 3?

SOLUTION:—1 is $\frac{1}{5}$ of 5, and 3 is 3 times $\frac{1}{5}$ of 5, or $\frac{3}{5}$ of 5.

Therefore 3 is $\frac{3}{5}$ of 5.

2. What part of 5 is 4? of 5 is 2? of 7 is 3?

3. What part of 9 is 4? of 10 is 7? of 8 is 5?
of 8 is 7? of 11 is 3? of 13 is 6?

4. What part of 12 is 8? of 12 is 9? of 10 is 6?
of 15 is 10? of 16 is 12?

5. What part of 18 is 6? of 18 is 10? of 18 is 14?
of 20 is 15? of 25 is 15?

6. What part of 24 is 16? of 24 is 18? of 28 is 21?
of 35 is 25? of 30 is 24?

7. What part of 60 is 40? of 72 is 48? of 90 is 60? of 100 is 80? of 120 is 90?

8. What part of $\frac{3}{4}$ is $\frac{1}{4}$? of $\frac{4}{5}$ is $\frac{2}{5}$? of $\frac{5}{6}$ is $\frac{3}{6}$?

9. What part of $\frac{4}{9}$ is $\frac{2}{9}$? of $\frac{8}{11}$ is $\frac{2}{11}$? of $\frac{10}{11}$ is $\frac{5}{11}$? of $\frac{12}{13}$ is $\frac{4}{13}$? of $\frac{10}{17}$ is $\frac{5}{17}$? of $\frac{9}{12}$ is $\frac{5}{12}$?

10. What part of $2\frac{1}{4}$ is $\frac{3}{4}$? of $3\frac{1}{2}$ is $1\frac{1}{2}$? of $2\frac{2}{3}$ is $\frac{2}{3}$? of $3\frac{3}{4}$ is $2\frac{1}{4}$? of $2\frac{3}{8}$ is $1\frac{1}{8}$?

11. What part of $\frac{3}{4}$ is $\frac{2}{8}$?

SOLUTION:— $\frac{3}{4} = \frac{6}{8}$, and $\frac{2}{8} = \frac{2}{8}$; $\frac{2}{8} = \frac{2}{6}$ of $\frac{6}{8}$.
Therefore $\frac{2}{8}$ is $\frac{2}{6}$ of $\frac{3}{4}$.

12. What part of $\frac{3}{4}$ is $\frac{1}{2}$? of $\frac{2}{3}$ is $\frac{1}{3}$? of $\frac{3}{8}$ is $\frac{2}{8}$?

13. What part of $\frac{4}{5}$ is $\frac{2}{5}$? of $\frac{4}{5}$ is $\frac{1}{2}$? of $\frac{4}{5}$ is $\frac{3}{5}$? of $\frac{1}{5}$ is $\frac{1}{5}$? of $\frac{2}{3}$ is $\frac{1}{3}$? of $\frac{4}{7}$ is $\frac{1}{7}$?

14. What part of $2\frac{2}{3}$ is $1\frac{1}{3}$? of $3\frac{1}{2}$ is $1\frac{1}{2}$? of $3\frac{2}{3}$ is $2\frac{1}{3}$? of $5\frac{1}{2}$ is $3\frac{1}{2}$? of $3\frac{3}{4}$ is $2\frac{1}{4}$?

37. 1. If 8 sheep cost \$20, how much will 6 sheep cost?

SOLUTION:—Since 6 sheep are $\frac{3}{4}$ of 8 sheep, they will cost $\frac{3}{4}$ of \$20, or \$15. Therefore, etc.

2. How much will 15 loads of sand cost if 10 loads cost \$21?

3. If 9 oranges cost 30 cents, how much will 6 oranges cost?

4. A train runs at the rate of 50 miles an hour. How far will it run in 48 minutes?

5. A ball cost 75 cents, and a bat cost 45 cents. What part of the cost of the ball was that of the bat?

6. John receives $1\frac{1}{2}$ dollars a day, and his father \$2 $\frac{1}{2}$. They work each the same number of days, and John's pay amounts to \$42. How much should his father receive?

7. If $3\frac{3}{4}$ acres of land cost \$600, how much should $6\frac{1}{4}$ acres cost at that rate?

8. The hay on $1\frac{3}{4}$ acres of land amounted to $3\frac{2}{3}$ tons. At that rate, how much would $5\frac{1}{4}$ acres yield?

9. If 3 men can earn \$11 $\frac{1}{4}$ in a certain time, how much can 7 men earn in the same time?

10. A farmer sold $\frac{2}{3}$ of $\frac{1}{2}$ of a flock of sheep for \$80. What was the remainder of the flock worth if it was sold at the same rate?

11. Henry studied $1\frac{1}{2}$ hours, and his sister $\frac{2}{3}$ as long. How long did his sister study?

12. If a man can row $13\frac{1}{3}$ miles in $2\frac{2}{3}$ hours, how far, at that rate, can he row in $4\frac{1}{3}$ hours?

13. If \$9 $\frac{3}{4}$ will pay for $1\frac{5}{8}$ cords of wood, how much wood can be bought for \$39?

14. A barrel of flour can be bought for \$5 $\frac{3}{5}$. What part of a barrel can be bought for \$3 $\frac{1}{5}$?

15. If 4 men can do a piece of work in 6 days, how long will it take 3 men to do it?

16. If a man can do a piece of work in 16 days, working 10 hours a day, how long will it take him to do it if he works 8 hours a day?

17. If 4 horses can eat $3\frac{1}{2}$ tons of hay in one month, how long will 8 tons last 10 horses?

18. If a barrel of flour will last a family of 6 persons $4\frac{1}{2}$ weeks, how long will it last a family of 4 persons?

19. If a horse can eat $1\frac{1}{2}$ bushels of oats in a week, how long will 24 bushels last 8 horses?

20. A merchant exchanged $6\frac{1}{2}$ yards of silk at $\$1\frac{1}{2}$ per yard for $12\frac{3}{4}$ bushels of wheat. At that rate what was the cost of the wheat per bushel?

21. John earns $\$4$ as often as James earns $\$3$. When together they have earned $\$93$, how much has each earned?

22. Two persons travel toward each other, one at 3 miles per hour, and the other at $4\frac{1}{2}$ miles per hour. When they meet, one has traveled 30 miles farther than the other. How far apart were they?

23. A can do a piece of work in 2 days. What part of it can he do in 1 day? If B can do the same piece of work in 3 days, what part of it can he do in 1 day? What part can both together do in 1 day? If they both together could do $\frac{1}{6}$ of it in 1 day, how many days would it take them to do it all? Since they can both together do $\frac{5}{6}$ of it in 1 day, how many days will it take them to do it all?

24. A can do a piece of work in 5 days, and B can do it in 6 days. How long will it take both to do it?

25. A and B can do a piece of work in 4 days, and A can do it alone in 6 days. How long will it take B to do it?

26. If a boy can ride a bicycle 16 miles in $1\frac{1}{2}$ hours, how far, at that rate, can he ride in $4\frac{3}{4}$ hours?

27. In a certain school $\frac{2}{3}$ of $\frac{1}{5}$ of the pupils are boys. How many girls are there if the school contains 60 pupils?

28. A man can do a piece of work in 9 days. How much should he receive for $3\frac{2}{5}$ days' work, if he gets \$35 for the whole?

29. If $\frac{1}{8}$ of a thousand feet of lumber cost \$8 $\frac{3}{8}$, how much should be paid for $\frac{5}{8}$ of a thousand feet?

30. A farmer sold $\frac{2}{3}$ of a farm at \$40 an acre for \$500. How many acres were there in the farm?

31. A can earn \$10 in $2\frac{1}{2}$ days, and B in $3\frac{1}{2}$ days. In how many days can they together earn \$48?

32. A can do a piece of work in 4 days, and B can do it in 7 days. How long will it take both together to do the work?

33. A can do a piece of work in 2 days, B can do it in 3 days, and C can do it in 4 days. In how many days can all together do the work?

34. A can do a piece of work in $2\frac{1}{2}$ days, and B can do it in $3\frac{1}{2}$ days. If they work together until it is completed and earn \$24, how much should each receive?

SOLUTION:—Since A can do the work in $2\frac{1}{2}$ days, he can do $\frac{2}{5}$ of the work per day, and since B can do the work in $3\frac{1}{2}$ days, he can do $\frac{2}{7}$ of the work per day. Both working together can therefore do $\frac{2}{5} + \frac{2}{7}$, or $\frac{24}{35}$, of the work per day. Since A does $\frac{2}{5}$, or $\frac{14}{35}$, of the work per day, and both together do $\frac{24}{35}$ of the work per day, A does $\frac{14}{24}$ of the work done by both each day, and consequently he is entitled to $\frac{14}{24}$ of \$24, the sum earned, which is \$14. B's share is therefore $\frac{10}{24}$ of \$24, or \$10.

35. A can do a piece of work in $1\frac{1}{2}$ days, and B can do it in $2\frac{1}{4}$ days. If they work together until it is completed and earn \$6, how much should each receive?

36. A can do a piece of work in $2\frac{1}{3}$ days, and B can do it in $3\frac{1}{4}$ days. If they work together until it is completed, and earn \$6.70, how much should each receive?

37. If 5 men can do a piece of work in $3\frac{3}{8}$ days, in what time can 3 men do the same work?

38. For every \$2 A has, B has \$3, and together they have \$120. How much has each?

39. If you increase a certain number by 26 more than $\frac{4}{9}$ of it, the sum will be 104. What is the number?

40. Charles had $3\frac{1}{2}$ times as much money as James. He spent half his money and earned \$5 and then both together had \$60. How much had each?

41. After selling $\frac{1}{3}$ of my chickens and $\frac{1}{2}$ of the remainder I had 30 left. How many had I at first?

42. If 3 men do a piece of work in 10 days, how long will it take 2 men to do a piece of work twice as great?

43. A earns \$5 per day, and B earns \$4 per day. At the end of a certain time they have together earned \$180. How much has each earned?

44. Three men agreed to do $\frac{4}{5}$ of a piece of work, for the whole of which \$150 was to be paid. They worked 2, 3, and 7 days respectively. How much should each receive?

45. If apples are bought at 6 for 5 cents, and sold at 4 for 5 cents, how many must be sold to gain 50 cents?

46. A coal dealer sold $\frac{3}{11}$ of his coal, and had 100 tons more left than he sold. How many tons had he at first?

47. A bicyclist goes 56 miles in $4\frac{2}{3}$ hours. At that rate how far will he go in $5\frac{3}{4}$ hours?

48. A is $\frac{3}{4}$ as old as B, and B $\frac{3}{4}$ as old as C. How old is each, if the sum of their ages is 108 years?

49. A can plow 3 acres in 2 days, and B 4 acres in 3 days. How much can both plow in 12 days?

50. If 5 pounds of lard are worth 2 pounds of butter, how much should be paid for $1\frac{1}{2}$ pounds of butter, when lard is 12 cents a pound?

51. Divide \$740 among A, B, and C, so that A shall have $\frac{3}{4}$ as much as B, and B $\frac{3}{4}$ as much as C.

52. A farmer sold $\frac{3}{4}$ of his chickens, and then $\frac{1}{4}$ of the remainder, and had 90 chickens left. How many had he at first?

53. A horse travels 20 miles in $1\frac{2}{3}$ hours. How far, at that rate, will he go in $4\frac{3}{4}$ hours?

54. A father is 28 years older than his son. How old is each if the son is $\frac{3}{7}$ as old as his father?

55. After expending \$100, and then earning $\frac{2}{3}$ as much as he had left, Mr. Jones had \$210. How much had he at first?

56. Five sixths of my wages for a month is \$60 less than $\frac{2}{3}$ of my wages for two months. How much do I earn per month?

57. If the sum of $\frac{2}{3}$ and $\frac{3}{4}$ of a number is multiplied by $2\frac{1}{2}$, the product is 85. What is the number?

58. A man bought $\frac{1}{4}$ of a vessel and sold $\frac{3}{4}$ of his share for \$16,000. At that rate, what was the value of the vessel?

59. A sum of money was divided among three boys. The first received $\frac{1}{2}$ of it, the second $\frac{1}{5}$ of it, and the third \$60 more than the second. What was the share of each?

60. A grocer pays 30 cents per dozen for eggs. He sells them so as to gain 5 cents on each 25 cents' worth sold. How many does he give for 25 cents?

61. How much corn at $37\frac{1}{2}$ cents a bushel can be bought for \$21?

62. If $\frac{3}{4}$ of a yard of broadcloth costs \$4 $\frac{1}{5}$, how much can be bought for \$14?

63. I bought a horse for \$140, which was $\frac{1}{3}$ less than its value, and sold it for $\frac{1}{4}$ more than its value. How much was the gain?

64. A, B, and C owned a flock of sheep, of which A owned $\frac{1}{4}$, B $\frac{1}{5}$, and C 12 more than both A and B. How many sheep were there?

65. How much change is received out of a fifty-dollar bill, after paying for 18 bushels of cranberries at \$2 $\frac{2}{3}$ per bushel?

66. A sleigh cost \$75, which was $\frac{3}{5}$ of 5 times the cost of the harness. How much did the harness cost?

67. A merchant sold 8 barrels of flour for \$54, and gained \$1 $\frac{1}{3}$ per barrel. How much did it cost him per barrel?

68. A girl bought at one time 2 $\frac{3}{4}$ yards of ribbon, and at another 3 $\frac{1}{2}$ yards at the same price per yard. It all cost \$1. How much did it cost per yard?

69. If 3 $\frac{1}{2}$ yards of silk cost \$20, how much will 16 $\frac{2}{3}$ yards cost?

70. A farmer sold 4 tons of his hay for \$62, and half of the remainder at \$16 $\frac{2}{3}$ per ton. If he received \$162 for what he sold, how much had he at first?

71. A man sold 3 $\frac{3}{4}$ cords of wood at \$1 $\frac{3}{8}$ per cord. What he received was 1 $\frac{1}{2}$ times what he paid for one ton of coal. What was the cost of the coal per ton?

72. A farmer paid \$70 for 2 cows. How much did each cost if one cost $\frac{2}{3}$ as much as the other?

73. $\frac{2}{5}$ of a number increased by $\frac{1}{2}$ of $\frac{2}{3}$ of 60 is 35. What is the number?

74. Mary is 20 years old, and $\frac{2}{5}$ of her age is $\frac{1}{2}$ of $\frac{3}{5}$ of her sister's age. How old is her sister?

75. If $\frac{2}{3}$ of a number is divided by 1 $\frac{1}{2}$, the quotient will be 16. What is the number?

76. A sold B a watch and gained $\frac{1}{5}$ of its cost. If he had received \$5 more, he would have gained $\frac{1}{4}$ of its cost. How much did the watch cost?

77. If a man can drive 45 miles in 4 $\frac{1}{2}$ hours, at that rate how long will it take him to drive 75 miles?

78. A cistern has 2 pipes, one of which can empty it in 2 hours, and the other can fill it in 3 hours. If the cistern is full, and both pipes are set running, in how many hours will it be emptied?

79. A man paid $\frac{2}{5}$ of his money for an overcoat, and then earned $\frac{1}{3}$ as much as he had left, after which he had \$15 less than he had at first. How much did the overcoat cost?

80. A dealer sold 5 barrels of apples for \$17 $\frac{1}{2}$, which was $\frac{5}{8}$ as much as he received for all he had left at \$4 a barrel. How many barrels did he have in all?

81. Henry solved $1\frac{2}{5}$ times as many problems as William. Upon counting them it was found that Henry had solved 12 more than William. How many did each solve?

82. If a stick $3\frac{1}{2}$ feet long will cast a shadow of $4\frac{2}{3}$ feet, how long will be the shadow of a stick 6 feet long?

83. An orchard has $\frac{1}{3}$ apple trees, $\frac{1}{5}$ pear trees, and the remainder peach trees. How many trees are there in the orchard, if there are 70 peach trees?

84. If 9 men can do a piece of work in $6\frac{2}{3}$ days, how long will it take 6 men to do the same work?

85. My horse cost $3\frac{1}{2}$ times as much as my sleigh, and together they cost \$360. What was the cost of each?

86. If $\frac{3}{4}$ of a yard of cloth costs $\$ \frac{1}{2}$, how much will $5\frac{3}{4}$ yards cost?

87. A boy lost $\frac{3}{7}$ of his marbles. He gave $\frac{1}{2}$ of the remainder to his brother, and had 30 marbles left. How many had he at first?

88. One pedestrian is 48 steps ahead of another, and goes 3 steps while the other goes 5. How many steps will the one in advance go before he is overtaken, if the steps of both are of equal length?

89. If $3\frac{1}{2}$ gallons of kerosene will last a family 2 weeks, how much will it cost at 12 cents a gallon to provide oil for a family for 5 weeks and 3 days?

90. If a horse eats $\frac{5}{8}$ of a ton of hay in one month, how much will it cost to supply 5 horses with hay for 3 months at \$16 per ton?

91. If $\frac{3}{4}$ of a bushel of clover seed is used to sow one acre, how much will it cost to sow 4 acres, when clover seed is \$16 per bushel?

92. When $\frac{2}{3}$ of $\frac{1}{2}$ of my money is \$10 less than $\frac{2}{5}$ of my money, how much have I?

93. If $\frac{4}{5}$ of a yard of cloth costs \$2 $\frac{2}{5}$, how much can be bought for \$27?

94. A can walk as far in 3 $\frac{1}{3}$ hours as he can drive in 1 $\frac{1}{4}$ hours. At what rate per hour does he walk, if he drives 10 miles per hour?

95. Two trains going in the same direction are 30 miles apart. The train behind gains upon the other 1 $\frac{7}{8}$ miles per hour. In how many hours will they be together?

96. A man receives \$100 for 5 $\frac{1}{2}$ weeks' labor. How much should he receive for 8 $\frac{1}{4}$ weeks' labor?

97. If bread is sold at 6 cents a loaf when flour is \$6 $\frac{3}{4}$ a barrel, what should be charged for loaves of the same size when flour is \$8 $\frac{1}{2}$ per barrel?

98. If \$3 is paid for sawing some wood composed of sticks 4 feet long into 2 pieces, how much should be paid to saw it into 3 pieces?

99. How many barrels of cider at \$2 $\frac{7}{8}$ per barrel, can be bought for \$115?

100. If Mr. Chadwick were 2 $\frac{1}{2}$ times as old as he is, $\frac{3}{5}$ of his age would be 60 years. How old is he?

101. A man owns $\frac{2}{5}$ of a farm. After selling 10 acres, he owns $\frac{3}{10}$ of the farm. How many acres are there in the farm?

102. If $3\frac{1}{2}$ cords of wood cost as much as $2\frac{1}{2}$ tons of coal, how much will 10 tons of coal cost when wood is \$4 a cord?

103. Some sheep that cost \$6 each were sold for \$80, which was only $\frac{2}{3}$ of their cost. How many were there?

104. Turkeys that were bought at \$ $\frac{5}{8}$ each were sold for \$ $10\frac{1}{2}$ a dozen. How much was gained on 100 turkeys?

105. If $5\frac{1}{2}$ pounds of meat cost 99 cents, how much will $6\frac{2}{3}$ pounds cost?

106. A man bought $4\frac{3}{4}$ tons of coal for \$9.50 and sold $2\frac{2}{3}$ tons at cost. How much did he get for it?

107. If $\frac{2}{3}$ of $\frac{3}{4}$ of a number is 30 more than $\frac{3}{4}$ of $\frac{2}{3}$ of the number, what is the number?

108. After expending $\frac{2}{3}$ of my money, \$45 is $\frac{3}{4}$ of what is left. How much had I at first?

109. If 6 men require $3\frac{1}{2}$ days to do a piece of work, how long will it take 7 men to do the same work?

110. If Mary can make a cloak in $2\frac{1}{2}$ days, how many cloaks can she make in 15 days?

111. How much will $\frac{2}{3}$ of a ton of hay cost if $2\frac{3}{4}$ tons cost \$33?

112. A boy sold $\frac{2}{3}$ of his doves and then bought $\frac{3}{4}$ as many as he had sold. How many doves had he at first if he then had 90?

113. A man bought 12 yards of sheeting at $12\frac{1}{2}$ cents a yard and paid for it with eggs at 3 for 5 cents. How many dozen eggs did it take?

114. By selling a watch for $1\frac{1}{2}$ times its cost I shall gain \$3 more than if I sell it for $1\frac{1}{4}$ times its cost. How much did it cost?

115. In a storm at sea the mast of a ship was broken into three pieces. The piece left standing was $\frac{2}{3}$ as long as the middle piece and $\frac{2}{3}$ as long as the end piece. How long is the piece left standing if the sum of the lengths of the pieces broken off is 84 feet?

SUGGESTION:— $\frac{2}{3}$ of the middle piece equals $\frac{2}{3}$ of the end piece.

116. In making a journey, a man went $\frac{1}{3}$ of the distance the first day, $\frac{2}{3}$ of the remaining distance the second day, and 40 miles the third day. What was the length of the journey?

117. If 5 bushels of wheat cost \$1 $\frac{1}{4}$ more than 5 bushels of corn, what is the price of each per bushel if one bushel of each together costs \$1?

118. If $\frac{2}{3}$ of the number of boys in a school is equal to $\frac{3}{4}$ of the number of girls, and the number of both is 850, how many of each are there?

119. After expending 10 cents more than $\frac{2}{3}$ of my money I had 80 cents left. How much had I at first?

38. 1. What part of \$1 is 25 cents? 50 cents? 75 cents? $12\frac{1}{2}$ cents? $37\frac{1}{2}$ cents? $62\frac{1}{2}$ cents? $87\frac{1}{2}$ cents? $6\frac{1}{4}$ cents (one half of $12\frac{1}{2}$ cents)? $18\frac{3}{4}$ cents ($12\frac{1}{2}$ cents + $6\frac{1}{4}$ cents)? $33\frac{1}{2}$ cents? $66\frac{3}{4}$ cents? $16\frac{3}{4}$ cents? $8\frac{1}{2}$ cents?

2. What will be the cost of 144 dozen eggs at $12\frac{1}{2}$ cents per dozen?

SUGGESTION:— $12\frac{1}{2}$ cents is $\frac{1}{4}$ of a dollar. At a dollar per dozen the eggs would cost \$144.

3. What will be the earnings of a boy in 44 days at 75 cents per day?

4. When molasses sells at $37\frac{1}{2}$ cents per gallon, how much will 32 gallons cost?

5. A web of cloth containing 48 yards was sold at $62\frac{1}{2}$ cents per yard. For how much did it sell?

6. When peaches sell at $37\frac{1}{2}$ cents per peck, how much will 6 bushels, or 24 pecks, cost? How much will they cost if the price is $66\frac{2}{3}$ cents per peck?

7. A chest of choice tea containing 56 pounds was sold at $87\frac{1}{2}$ cents per pound. For how much was it sold?

8. A man worked in one week 48 hours at $12\frac{1}{2}$ cents per hour. How much did he earn? How much would he have earned at $66\frac{2}{3}$ cents per hour?

9. The fare from Bronson to Oldwell is 75 cents. How much must be paid for tickets for an excursion party that numbers 60?

10. What part of \$1 is 25 cents? of \$10 is \$2.50? of \$100 is \$25? of \$1000 is \$250? What part of 100 is 25? of 10 is 25? of 1000 is 250?

11. What part of \$1 is 50 cents? of \$10 is \$5? of \$100 is \$50? of \$1000 is \$500? What part of 100 is 50? of 1000 is 500?

12. What part of \$1 is 75 cents? of \$10 is \$7.50? of \$100 is \$75? of \$1000 is \$750? What part of 100 is 75? of 10 is 7.5? of 1000 is 750?

13. What part of \$1 is $12\frac{1}{2}$ cents? of \$10 is \$1.25? of \$100 is \$12.50? of \$1000 is \$125? What part of 100 is $12\frac{1}{2}$? of 10 is 1.25? of 1000 is 125?

14. What part of \$100 is \$37 $\frac{1}{2}$? of \$100 is \$62 $\frac{1}{2}$? of \$100 is \$87 $\frac{1}{2}$? of \$100 is \$33 $\frac{1}{3}$? of \$100 is \$66 $\frac{2}{3}$? of \$100 is \$16 $\frac{2}{3}$? of \$100 is \$8 $\frac{1}{3}$?

15. What part of 1000 is 375? of 1000 is 625? of 1000 is 875? of 100 is 66 $\frac{2}{3}$? of 100 is 33 $\frac{1}{3}$? of 100 is 16 $\frac{2}{3}$? of 100 is 8 $\frac{1}{3}$? of 1000 is 666 $\frac{2}{3}$?

16. What is the product of 37 $\frac{1}{2}$ times 48?

SOLUTION:—Since 37 $\frac{1}{2}$ is $\frac{3}{4}$ of 100, 37 $\frac{1}{2}$ times 48 is $\frac{3}{4}$ of 100 times 48. 100 times 48 is 4800, and $\frac{3}{4}$ of 4800 is 3600. Therefore, etc.

Find the product of:

- | | | |
|---------------------------------|---------------------------------|---------------------------------|
| 17. $64 \times 62\frac{1}{2}$. | 23. $48 \times 66\frac{2}{3}$. | 29. $96 \times 87\frac{1}{2}$. |
| 18. 28×75 . | 24. $64 \times 37\frac{1}{2}$. | 30. $84 \times 16\frac{2}{3}$. |
| 19. $56 \times 12\frac{1}{2}$. | 25. $24 \times 33\frac{1}{3}$. | 31. $24 \times 62\frac{1}{2}$. |
| 20. $72 \times 37\frac{1}{2}$. | 26. 32×75 . | 32. $32 \times 37\frac{1}{2}$. |
| 21. $88 \times 62\frac{1}{2}$. | 27. $40 \times 62\frac{1}{2}$. | 33. 52×75 . |
| 22. $32 \times 87\frac{1}{2}$. | 28. $72 \times 12\frac{1}{2}$. | 34. $64 \times 87\frac{1}{2}$. |

35. What is the product of 48 times 375?

SUGGESTION:—375 is $\frac{3}{4}$ of 1000. Hence 375 times 48 is $\frac{3}{4}$ of 1000 times 48.

Find the product of:

- | | | |
|-----------------------|-----------------------|-----------------------|
| 36. 32×125 . | 41. 96×375 . | 46. 72×625 . |
| 37. 24×375 . | 42. 64×625 . | 47. 40×875 . |
| 38. 44×750 . | 43. 72×250 . | 48. 48×125 . |
| 39. 40×625 . | 44. 88×125 . | 49. 64×375 . |
| 40. 48×875 . | 45. 32×875 . | 50. 56×625 . |

51. What part of \$10 is \$3.75? \$1.25? \$6.25? \$8.75? \$1.66 $\frac{2}{3}$? \$3.33 $\frac{1}{3}$? \$6.66 $\frac{2}{3}$?

52. How much will it cost to plow 32 acres of land at \$3.75 per acre?

SOLUTION: —\$3.75 is $\frac{3}{4}$ of \$10. At \$10 per acre the plowing would cost \$320; but since \$3.75 is $\frac{3}{4}$ of \$10, it will cost $\frac{3}{4}$ of \$320, which is \$240. Therefore, etc.

53. How much will 72 sheep cost at \$6.25 per head?

54. A baker bought 88 barrels of flour at \$3.75 per barrel. How much did it all cost?

55. How much will 18 cords of wood cost at \$6.66 $\frac{2}{3}$ per cord?

56. How much must be paid for a case of boots containing 24 pairs at \$3.33 $\frac{1}{3}$ per pair?

57. The hats purchased for a company consisting of 64 men cost \$1.25 each. How much did they all cost?

58. A clothier sold 48 boys' overcoats at \$8.75 apiece. How much did he receive for all of them?

59. The railroad fare from Brantford to Hazeldon is \$3.75. How much must be paid for tickets for a party of 16?

60. The wages of a machinist were \$3.75 per day. How much did he earn in 24 days?

61. The porter on a sleeping car was paid \$37.50 per month for 16 months. How much did he earn?

SUGGESTION: —\$37.50 is $\frac{3}{4}$ of \$100.

62. The charge for tuition at a certain school was \$62.50 per quarter. If 40 pupils attended the school, to how much did the tuition fees amount?

63. A party of 32 went to Europe for the summer, paying \$87.50 each for their passage tickets. How much did they all pay?

64. What part of \$10 is \$6.25? \$16.25? \$26.25?

SUGGESTION:—\$6.25 is $\frac{1}{2}$ of \$10, and \$16.25 is $1\frac{1}{2}$, or $\frac{3}{2}$, of \$10.

65. What part of \$10 is \$3.75? \$13.75? \$23.75?

66. What part of \$10 is \$8.75? \$18.75? \$28.75?

67. What part of \$10 is \$1.25? \$11.25? \$21.25?

68. How much will 36 tons of hay cost at \$16.25 a ton?

SOLUTION:—\$16.25 is $\frac{1}{2}$ of \$10. At \$10 a ton 36 tons will cost \$360; at $\frac{1}{2}$ of \$10 a ton, the cost will be $\frac{1}{2}$ of \$360, or \$585.

Therefore 36 tons of hay at \$16.25 per ton will cost \$585.

69. A drover bought 48 head of cattle at \$18.75 a head. How much did they cost?

70. How much does a man earn in a year if he earns \$17.50 a week?

71. Find the cost of 48 acres of land at \$13.75 an acre.

72. How much does a man save in 28 weeks, if he gets \$30 a week and saves $\frac{2}{7}$ of it?

73. A hardware dealer sold 56 lathes at \$28.75 each, and $\frac{3}{8}$ of the selling price was gain. How much did he gain?

74. A clothier sold 72 suits of clothes at \$21.25 a suit. How much did he gain if they cost him \$15 a suit?

75. How many eighths of 1000 are there in 1875? in 2625? in 1125? in 2375?

SUGGESTION:—Since 875 is $\frac{7}{8}$ of 1000, 1875 is $1\frac{1}{8}$, or $\frac{9}{8}$, of 1000.

76. What is the product of 52 multiplied by 1375?

77. What is the value of 16×2375 ? of 24×1625 ? of 36×1875 ? of 44×2125 ?

78. A drover bought 28 horses at \$162.50 a head. How much did they cost?

79. A farm of 48 acres was sold at \$375 per acre. How much was received for it?

80. How much does a man earn in 18 years whose salary is \$1875 per year?

81. A mining company shipped 36 tons of ore per day. What was the value of the output, if it was sold for \$175 a ton?

82. If a steamer averages 375 miles a day, how far can it go in 18 days?

83. If a farmer can raise 125 bushels of potatoes on one acre, how many bushels can he raise on 29 acres?

84. How much must be paid for 48 shares of bank stock at \$36.66 $\frac{2}{3}$ per share?

85. A man paid \$38.75 per month rent. How much was that per year?

39. 1. How many books at 75 cents each can be bought for \$9?

2. A boy working for \$1.37 $\frac{1}{2}$ per day earned in a certain time \$33. How many days did he work?

3. How many times is 133 $\frac{1}{3}$ contained in 800? in 1200? in 2000? in 3600?

4. At \$2.87 $\frac{1}{2}$ a cord, how much wood can be bought for \$230?

SUGGESTION:—\$2.87 $\frac{1}{2}$ is \$2 $\frac{1}{2}$, or \$2 $\frac{3}{4}$.

5. How many tons of coal at \$4.75 per ton can be bought for \$190?

6. A man earns \$3.75 a day. How long will it take him to earn \$60?

7. At \$16.25 a ton, how many tons of hay can be bought for \$91?

SUGGESTION:—\$16.25 is $\frac{1}{4}$ of \$10.

8. If a man pays \$2300 for land at \$28.75 per acre, how many acres does he buy?

9. A certain number multiplied by 875 gives a product of 28,000. What is the number?

SUGGESTION:—If the multiplier had been 1000, the number would have been 28; but 875 is $\frac{7}{8}$ of 1000, therefore 28 is $\frac{7}{8}$ of the number.

10. At \$13.75 per week how long will it take a salesman to earn \$880?

11. An ocean steamer that averages 375 miles a day makes a voyage of 6000 miles. How long does it take?

12. A vessel pays \$1.25 toll per ton for passing through the Suez Canal. What is her tonnage if the toll charges are \$4500?

13. Mr. Bruce is $36\frac{1}{8}$ years old, and his son is $10\frac{1}{8}$ years old. How many times the son's age is the father's?

14. If John can walk $2\frac{7}{8}$ miles per hour, how long will it take him to go 69 miles?

15. If $1\frac{3}{8}$ gallons of sirup cost \$1, how many gallons can be bought for \$110?

16. A coal dealer sold $\frac{3}{8}$ of his coal at \$3.87 $\frac{1}{2}$ a ton and realized \$930. How many tons had he?

17. Shoes bought at $\$2.62\frac{1}{2}$ per pair are sold at $\$3.37\frac{1}{2}$. If $\$12$ is the gain on one case of such shoes, how many pairs were there in each case?

18. How many times is $\$21.25$ contained in $\$850$? in $\$1020$? in $\$1700$?

19. A wagon load of potatoes sold at $62\frac{1}{2}$ cents a bushel brought $\$72$. How many bushels of potatoes were there in the wagon?

20. How many days must a man work at $\$1.87\frac{1}{2}$ a day to earn $\$60$?

21. When gloves are $\$1.37\frac{1}{2}$ a pair, how many pairs can be bought for $\$110$?

22. Some cattle were bought at $\$31.25$ a head. How many were there, if they all cost $\$1000$?

23. A train runs $36\frac{1}{4}$ miles per hour. In how many hours can it run 580 miles?

24. What is the value of $6300 \div 26\frac{1}{4}$? of $9300 \div 38\frac{3}{4}$? of $9100 \div 162\frac{1}{2}$?

25. A man expended $\$800$ for hay at $\$16.66\frac{2}{3}$ a ton. How many tons did he buy?

26. A man pays a debt of $\$740$ at the rate of $\$46.25$ per month. In what time does he pay the debt?

27. A man buys land at $\$18.75$ per acre and sells it at $\$36.25$ per acre. How many acres must he sell to gain $\$700$?

28. How many yards of sheeting at $18\frac{3}{4}$ cents per yard can be bought for $\$15$?

29. A merchant sold umbrellas at $\$1.75$ each. How many were there if he sold all he had and received for them $\$56$?

40. 1. Two men did a piece of work for \$72. One worked 11 days, and the other 7 days. If their daily wages were the same, how much should each receive?

2. Two boys bought 48 marbles for 8 cents. One paid 5 cents, and the other 3 cents. How many should each receive?

3. A man bought an equal number of sheep and pigs for \$130. The sheep cost \$5 each, and the pigs \$8 each. How much did he pay for the sheep, and how much for the pigs?

4. Two men, 120 miles apart, approach each other at the rates of 3 miles and 5 miles per hour respectively. When they meet, how many hours will each have traveled? How far will each have traveled?

5. Divide the number 140 into 2 parts that shall be to each other as 4 to 3.

SUGGESTION:—In every 7 units of the given number 4 units belong in one part and 3 in the other.

6. One drover had 14 horses, and another 11. A farmer charged them \$37½ for keeping the animals. How much should each drover pay?

7. A and B plowed a field for \$30. A worked 7 days, and B 5 days. How much should each receive?

8. A teacher had an equal number of boys and girls in her class. She gave 4 questions to each boy, and 3 to each girl. In all she gave 280 questions. How many pupils were there in the class?

9. Two men hire a boat for \$21. The first uses it 16 days and the second 26 days. How much should each pay?

10. A man paid \$52 for the pasture of 8 horses and 14 cows. How much did the pasturage of the horses cost, and how much the pasturage of the cows, if 2 horses eat as much as 3 cows?

11. Two numbers are to each other as 7 to 9, and their sum is 80. What are the numbers?

12. A and B agree to do a piece of work for \$130. A sends 5 men, and B 12 boys. How much should each receive if 3 boys can do as much work as 2 men?

13. One contractor has 6 men on a piece of work for 4 days, and another contractor has on the same work 5 men for 6 days. They receive together for the work \$108. How much belongs to each?

14. Three men together bought 600 bushels of potatoes. The first paid $\frac{1}{3}$ of the cost, the second $\frac{1}{4}$, and the third paid the remainder. How many bushels should each receive?

15. Three gangs of workmen build a boat for \$650; the first gang of 6 men works 5 days, the second of 5 men works 8 days, and the third of 10 men works 6 days. How much should each gang get?

16. A piece of work is done by 4 men and 7 boys in 4 days for \$68. If 2 men can do as much as 5 boys, what are the daily earnings of a man and of a boy?

17. Divide \$280 among A, B, and C, so that A shall receive \$2 as often as B receives \$5, and C \$7.

18. Three boys together bought 48 apples, the first paying 4 cents, the second 5 cents, and the third 7 cents. How many apples should each receive?

19. If 3 oranges cost as much as 5 apples, and a dozen of each cost together 96 cents, how much do they cost apiece?

20. Two men bought a horse for \$100, of which the first paid \$60. They sold it for \$150. How much of the selling price should each receive?

21. Into a pasture that was rented for \$72, A put 4 horses, B 9 cows, and C 21 sheep. How much should each pay for his share of the rent, if 2 horses eat as much as 3 cows, and 1 cow as much as 7 sheep?

22. Two partners together gained \$850. The first put into the business \$250 for 4 months, and the second \$350 for 2 months. Find each man's share of the gain.

SUGGESTION:—The investment of the first was the same as \$1000 for 1 month, and the investment of the second the same as \$700 for 1 month.

41. 1. A lady bought a certain number of yards of lace at 8 cents a yard. If she had paid 12 cents a yard, it would have cost 48 cents more. How many yards did she buy?

SOLUTION:—Paying 12 cents a yard instead of 8 cents makes the cost 4 cents more for each yard. Since the total difference in the cost was 48 cents, she must have bought as many yards as 4 cents are contained times in 48 cents, or 12 yards. Therefore, etc.

2. A man gave some children 5 cents each. If he had given them 10 cents each, it would have taken 50 cents more. How many children were there?

3. A man bought some calves at \$5 each and had \$45 left. If he had bought as many hogs at \$7 each, he would have had only \$5 left. How many calves did he buy?

4. A teacher took some pupils on an excursion, and after expending 15 cents for each pupil, she found that she had \$2 left. If she had expended 20 cents for each, she would have had only \$1 left. How many pupils were there?

5. If I had paid 5 cents each instead of 3 cents for a certain number of oranges, they would have cost 24 cents more than they did cost. How many did I buy?

6. A lady had money enough to pay 15 cents a yard for some ribbon, and have 50 cents left. If she had paid 25 cents a yard for it, she would have needed 50 cents more. How many yards were there, and how much money had she?

7. A man divided 45 excursion tickets among an equal number of boys and girls, giving to each boy 4, and to each girl 5. How many children were there?

8. A farmer sold an equal number of sheep and pigs for \$100. How many were there of each, if he received \$4 each for the sheep and \$6 each for the pigs?

9. Two men together earn \$60 in a certain time. How much should each receive, if they are paid at the rate of \$ $1\frac{1}{2}$ and \$ $2\frac{1}{2}$ a day respectively?

10. If a drover pays \$40 a head for some cattle, he will have \$20 left; but if he pays \$50 a head, he will need \$100 more with which to pay for them. How many are there?

11. I bought some lemons at 3 cents each and twice as many oranges at 4 cents each. They all cost \$1.10. How many were there of each?

42. 1. Mary can make a dress in $3\frac{1}{2}$ days. What part of the work can she do in $\frac{1}{2}$ day? in 1 day?

2. A, B, and C can dig a trench in $2\frac{2}{3}$ days; B alone can do it in 8 days; B and C can do it in $4\frac{1}{2}$ days. In what time can A and C each do it?

3. If 3 men can do as much work as 5 boys, and if 5 men can do a piece of work in 6 days, how long will it take 5 men and 10 boys to do the work?

4. A can plow a field in 4 days, and B can do it in 6 days. How long will it require to do the work if B works only half as long as A?

5. A can mow $\frac{1}{2}$ of a field while B mows $\frac{3}{4}$ of it. If they can together mow it in $3\frac{2}{3}$ days, in what time can each alone do the work?

6. A can make a coat in 3 days, and B can make 4 coats in 10 days. How long will it take them to make 11 coats together?

7. A and B can build a wall in 3 days, A and C in 6 days, and B and C in $2\frac{2}{3}$ days. In what time can each alone, and all together, do the work?

SUGGESTION:—A and B can do $\frac{1}{3}$ of the work in 1 day; A and C can do $\frac{1}{6}$ of the work in 1 day; B and C can do $\frac{1}{1\frac{2}{3}}$ of the work in 1 day. Hence, twice what A, B, and C can do in one day is $1\frac{1}{3}$ of the work.

8. A and B can do a piece of work in 4 days, A and C in 6 days, and B and C in 8 days. How long will it take each one to do the work?

9. A and B can row a distance in 4 hours. B can do it alone in 9 hours. After they have rowed together 3 hours A finishes. How long does it take him?

43. 1. The sum of two numbers is 30, and their difference is 8. What are the numbers?

SOLUTION:—Since one is 8 more than the other, their sum, 30, is 8 more than twice the less. Hence 22 is twice the less; and 11 is the less, and 19 the greater. Therefore, etc.

2. Two girls have together 43 buttons, of which one has 9 more than the other. How many has each?

3. The sum of two numbers is 50; their difference is 12. Find the numbers.

4. Harry and his brother earned \$1, of which Harry earned 30 cents more than his brother. How much did each earn?

5. A bushel of wheat cost 20 cents more than a bushel of rye, and a bushel of each cost together \$1 $\frac{2}{5}$. How much did each cost per bushel?

6. Louis and his brother had each the same number of marbles. Louis bought 25 more, and then they had together 85. How many had each?

7. Two farmers had each the same number of sheep. After one sold 25, and the other 35, together they had left 100. How many had each at first?

8. Two boys each bought a bicycle at the same price. One sold his for \$10 less than cost, and the other sold his for \$8 less than cost. The sum received for both was \$62. How much did they pay for them?

9. If $\frac{1}{2}$ the sum of two numbers is 39, and $\frac{1}{3}$ of their difference is 6, what are the numbers?

10. If $\frac{4}{5}$ of a number is increased by 10, 4 times the sum will be $\frac{2}{3}$ of 150. What is the number?

11. If $\frac{4}{5}$ of a certain number is multiplied by 4, $\frac{5}{6}$ of the product is 50. What is the number?

12. A and B dug in one day 103 bushels of potatoes. How many bushels did each dig, if A dug 12 bushels more than $\frac{5}{6}$ of what B dug?

13. Mr. Brown is 8 years more than twice as old as his son, and the difference in their ages is 22 years. How old is each?

14. After paying \$18 more than $\frac{2}{3}$ of my money for an overcoat, I have $\frac{3}{8}$ of it left. How much did the overcoat cost?

15. A farmer sold 20 acres less than $\frac{5}{6}$ of his land, and received \$4000 for the remainder at \$50 per acre. How many acres had he at first?

16. A has $2\frac{1}{4}$ times as many sheep as B; but if he sells 25 of his sheep to B, they will have the same number. How many has each?

17. Mary's age is $\frac{3}{8}$ of her mother's age, and in 3 years the sum of their ages will be 50 years. How old is each?

18. A boat goes down stream a certain distance; it then turns, and goes up stream 12 miles more than $\frac{3}{8}$ of the distance it sailed down. If the entire distance sailed was 20 miles, how far did it sail down stream?

19. If you should multiply a certain number by 5, subtract 16 from the product, and divide the remainder by 2, the quotient would be 72. What is the number?

20. A coat and a vest cost \$27. $\frac{1}{4}$ the cost of the coat, plus \$2, equals the cost of the vest. How much does each cost?

DENOMINATE NUMBERS

44. 1. How many inches are there in 1 foot? in 2 feet? in 5 feet? in 7 feet? in 11 feet?

2. How many inches are there in 1 foot 8 inches? in 2 feet 6 inches? in 1 yard? in 1 yard 2 feet?

3. How many feet are there in 24 inches? in 60 inches? in 84 inches? in 96 inches?

4. How many yards are there in 9 feet? in 15 feet? in 144 inches? in 108 inches?

5. How many yards are there in 2 rods? how many feet? How many feet are there in 4 rods? how many yards?

6. How many yards are there in 1 rod? how many feet? How many feet are there in 5 rods? how many yards?

7. When I pay 90 cents a yard for carpet 27 inches wide, how much should I pay for carpet of the same quality 1 yard wide?

8. If a piece of ribbon 1 foot 8 inches long costs 25 cents, how much should be paid for a piece of the same kind 1 yard 1 foot 6 inches long?

9. What will be the cost of a piece of silk velvet 60 inches long at \$6 a yard?

10. What will a piece of manilla rope 240 inches long cost at 18 cents a yard?

11. If a man goes 1 rod in 5 steps, how many steps will he take in going 1 mile?

12. If I pay 48 cents for 2 feet 8 inches of lead pipe, how much must I pay for a piece of the same kind 3 feet 9 inches long?

13. A horse runs 5 furlongs in 1 minute 25 seconds. At that rate how long will it take him to run 1 mile?

14. How much must be paid for a piece of mahogany molding 5 yards 2 feet 8 inches long, at 6 cents a foot?

15. A man who steps 30 inches at each step wishes to measure a distance of 100 yards. How many steps must he take?

16. How much will 50 yards of garden hose cost at 8 cents a foot?

45. 1. How many square inches are there in 2 square feet? in 3 square feet? in 10 square feet?

2. In 5 square yards how many square feet are there? in 8 square yards? in 10 square yards?

3. In 2 square rods how many square yards are there? how many square feet?

4. A farmer raises potatoes at the rate of 100 bushels to the acre. How many bushels should he get from a field containing 240 square rods?

5. A field of 5 acres is divided into lots each containing 100 square rods. How many lots are there?

6. At 10 cents a square foot, what will be the cost of a piece of zinc 6 feet square?

SUGGESTION:—The *area* of a square or oblong is equal to the product of the two numbers expressing its dimensions. These numbers must express units of the same name, and the result will be in square units of that name.

Thus the area of an oblong 3 feet long and 2 feet wide is 6 *square feet*.

7. How much must be paid for a mahogany plank 12 feet long and $1\frac{1}{2}$ feet wide at 20 cents a square foot?

8. At 20 cents a square yard, how much must be paid for sodding a lawn 5 yards long and 4 yards wide?

9. How many acres are there in a field 80 rods long and 20 rods wide?

10. At 20 cents a square foot, how much must be paid for a sheet of plate glass 10 feet long and 6 feet wide?

11. How much will it cost to plaster a ceiling 18 feet square, at 25 cents a square yard?

12. A lot 10 rods long contains half an acre. How wide is it?

13. A surveyor's chain is 4 rods long. How many acres are there in a field 10 chains long and 5 chains wide?

14. How many square feet are there in 3 boards, each 20 inches wide and 16 feet long?

15. What is the difference between a surface 5 yards square and one containing 5 square yards? between 4 square feet and 4 feet square?

46. 1. How many cubic inches are there in 2 cubic feet? in 10 cubic feet?

2. How many cubic feet are there in 2 cubic yards? in 5 cubic yards? in 2 cords?

3. A laborer gets 3 cents a cubic foot for digging a cellar. How much should he get for 3 cubic yards?

4. How many cords are there in a pile of wood 16 feet long, 8 feet high, and 4 feet wide?

SUGGESTION. — The *volume* of any rectangular solid is equal to the product of the three numbers representing its dimensions. The numbers must express units of the same name, and the result will be in solid units of that name.

Thus, the volume of a solid whose dimensions are 2 feet, 3 feet, and 4 feet is 24 *cubic or solid feet*.

5. What is the value of a block of granite 6 feet square and 5 feet high at 50 cents a cubic foot?

6. If it costs \$72 to excavate a cellar 6 yards square, at \$1 a cubic yard, how deep is the cellar?

7. How many cords of wood can be placed in a space 8 feet each way?

8. A bushel is almost exactly $1\frac{1}{4}$ cubic feet. How many bushels will a bin hold that is 8 feet long, 6 feet wide, and 5 feet deep?

9. What must be the capacity in cubic feet, of a bin that will hold 480 bushels of wheat? Give the dimensions of several such bins.

10. A square cellar that is 6 feet deep has a capacity of 600 cubic yards. What are its other dimensions?

11. A vat 25 feet long and 20 feet wide is full of water. How many cubic feet must be drawn off to sink the surface 6 feet?

12. A brick is usually 8 inches long, 4 inches wide, and 2 inches thick. How many such bricks are there in a pile whose dimensions are 8 feet, 4 feet, and 2 feet?

13. How many cubical blocks 2 inches on a side can be put into a box 8 inches on each side?

14. A cubic foot of water weighs $62\frac{1}{2}$ pounds. What weight of water would be contained in a cistern 5 feet square and 4 feet deep?

15. What will be the cost, at 25 cents a cubic foot, of a piece of marble 16 inches square and 27 feet long?

16. A block of stone 12 feet long and 8 feet wide, bought at 50 cents a cubic foot, cost \$288. How thick was it?

47. 1. How many gills are there in 1 pint? in 1 quart? in 1 gallon? in 2 quarts 1 pint?

2. How many quarts are there in 2 gallons? in 3 gallons 3 quarts? in 4 gallons 1 quart?

3. How many pints are there in 1 gallon 3 quarts? in 2 gallons 1 quart 1 pint? in 3 gallons 3 quarts 1 pint? in 1 gallon 2 quarts 1 pint?

4. What part of a gallon is 1 quart 1 pint? 2 quarts 1 pint 3 gills? 3 quarts 2 gills?

5. How many times $2\frac{1}{2}$ pints are $2\frac{1}{2}$ gallons? How many times are 3 pints 3 gills contained in $3\frac{3}{4}$ quarts?

6. A milkman buys milk at the rate of 16 cents a gallon and sells it at 5 cents a pint. How much must he sell to gain \$6?

7. A grocer buys 40 gallons of vinegar at 20 cents a gallon and retails it at 10 cents a quart. How much does he gain?

8. A grocer bought 30 gallons of sirup for \$24 and retailed it at 25 cents a quart. How much did he gain?

9. If a gallon of alcohol sells for $\$1\frac{1}{5}$, how much must be paid for 1 quart 1 pint? for 3 quarts 1 pint?

10. How much was received for 2 gallons of cream sold at 5 cents a gill?

11. If 8 vessels of equal size contain 3 gallons, how much does each vessel contain?

12. How many times can a lamp holding 1 pint 2 gills be filled from a can holding $1\frac{1}{2}$ gallons?

13. I pay $\$2\frac{4}{5}$ in 14 days for milk at 10 cents a quart. How much do I buy daily?

14. How much must be paid for 3 pints 2 gills of cologne at \$8 per gallon?

48. 1. How many quarts are there in a peck? how many pints? How many quarts are there in a bushel?

2. In 96 quarts how many pecks are there? how many bushels?

3. If 1 bushel of chestnuts is bought for $\$1\frac{3}{5}$, and sold at 10 cents a quart, how much is gained?

4. I bought $\frac{1}{2}$ bushel of cranberries for $\$1\frac{1}{4}$ and sold them at 10 a quart. How much was gained?

5. My chickens eat 1 quart 1 pint of corn daily. How long will 5 pecks last them?

6. A man picked 3 pecks of blueberries and sold them at 10 cents a quart. How much did he get for them?

7. At 30 cents a peck, how many bushels of apples can be bought for \$12?

8. What will be the cost of 1 bushel 3 quarts 1 pint of beans at \$1.28 a bushel?

9. What part of a bushel is 1 peck 3 quarts? 3 pecks 4 quarts? 2 pecks 6 quarts?

10. If 5 pints of chestnuts cost 30 cents, how much will 3 pecks cost?

11. A farmer sold 1 bushel 3 pecks 4 quarts of clover seed at \$8 a bushel. How much did he get for it?

12. A man sold 1 bushel 1 peck 5 quarts of cherries at 64 cents a bushel. How much did he get for them?

13. I paid \$1.60 per bushel for peanuts, and sold them at 5 cents for $\frac{1}{2}$ pint. How much did I gain on each peck?

14. At \$1 per bushel, how much will 3 bushels 3 pecks 4 quarts of potatoes cost?

49. 1. How many ounces are there in 1 pound Avoirdupois? in 2 pounds? in 5 pounds?

2. How many pounds are there in 32 ounces? in 48 ounces? in 80 ounces? in 64 ounces?

3. How many ounces are there in $1\frac{3}{4}$ pounds? in $2\frac{1}{2}$ pounds? in $5\frac{1}{2}$ pounds? in $4\frac{3}{4}$ pounds?

4. How many pounds are there in $1\frac{3}{4}$ hundredweight? in $2\frac{1}{2}$ hundredweight? in 3 hundredweight 75 pounds? in 5 hundredweight 67 pounds?

5. Change 3 pounds 12 ounces to ounces; 4 pounds 5 ounces; 5 pounds 6 ounces; 6 pounds 4 ounces.

6. How many hundredweight are there in $1\frac{1}{2}$ tons? in $1\frac{3}{4}$ tons? in $2\frac{3}{4}$ tons? in $3\frac{3}{4}$ tons?

7. At \$15 a ton, how much must be paid for 800 pounds of hay? for 2800 pounds? for 3000 pounds?

8. The coal in a wagon weighed 2300 pounds. How much was it worth at \$4 per ton?

9. Five boys share equally 2 pounds 8 ounces of candy. How much does each receive?

10. What will be the cost of 3 pounds 10 ounces of butter at 24 cents a pound?

11. What part of 1 hundredweight are 64 pounds? 40 pounds? 96 pounds? 70 pounds?

12. A granite block weighed 3 tons 16 hundredweight. How much did it cost at \$5 per ton?

13. If 4 marble blocks of equal size weigh together 1 ton 16 hundredweight, what is the weight of each?

14. I paid 60 cents for 3 pounds 12 ounces of beef. How much should be paid for 2 pounds 9 ounces?

50. 1. How many ounces are there in 1 pound Troy weight? in 2 pounds? in $3\frac{1}{2}$ pounds? in $2\frac{3}{4}$ pounds?

2. How many grains are there in 2 pennyweights? in 5 pennyweights? in $3\frac{1}{2}$ pennyweights? in $2\frac{3}{4}$ pennyweights? in $4\frac{1}{4}$ pennyweights?

3. Change 2 ounces to pennyweights; $3\frac{1}{2}$ ounces; $4\frac{3}{8}$ ounces; 1 pound; 1 pound 4 ounces.

4. How many grains are there in 1 ounce? in 1 pound? in 2 pounds 2 ounces?

5. How much will 1 pound of gold cost at 60 cents a pennyweight?

6. A gold watch case weighing $2\frac{1}{2}$ ounces was sold at 50 cents a pennyweight. How much was received for it?

7. What is the value of 1 ounce of metallic cerium at 50 cents a grain?

8. The price of the rare metal gallium is \$25 for $1\frac{1}{2}$ grains. At that rate, how much will 1 pennyweight of it cost?

9. What part of a pound is 1 ounce 4 pennyweights? What part of an ounce are 96 grains?

10. If a dozen spoons of equal weight are made from 3 pounds 6 ounces of silver, how much does each spoon weigh?

11. Pure gold is worth about 4 cents a grain. At that rate, how much will 1 pennyweight cost? 1 ounce?

51. 1. How many days are there in 3 weeks? in 4 weeks? in a fortnight?

2. In an ordinary year there are 365 days. How many weeks are there?

3. The year 1890 began on Wednesday. On what day did 1891 begin?

4. What is the greatest number of Sundays that can occur in a year?

5. The year 1892 began on Friday. On what day did 1893 begin? 1894? 1895?

6. Mention the months that have 31 days. Mention those that have 30 days.

7. A railroad train goes a mile in 1 minute 20 seconds. What is the rate per hour?

8. The length of a day is equal to twice the time at which the sun sets. How long is the day when the sun sets at 15 minutes to 7 o'clock?

9. The length of the night is equal to twice the time at which the sun rises. How long is the night when the sun rises at 10 minutes to 5 o'clock? How long is the day?

10. Which of the following years are leap years: 1850, 1860, 1868, 1890, 1900?

11. Which are the winter months in the northern hemisphere? in the southern hemisphere?

12. How many days are there from April 1 to July 4? from the beginning of winter to Christmas?

13. How many days are there in January, February, and March, 1896?

14. A man walked 13 miles in 4 hours 20 minutes. What was his rate per hour?

15. A horse runs $\frac{5}{8}$ of a mile in 1 minute 40 seconds. In what time will he run a mile at that rate?

16. At what time between 1850 and 1950 does it happen that 8 years elapse between leap years?

17. A boy goes to bed at half past eight and rises at 20 minutes to seven. How long is he in bed?

18. If a year begins on Sunday, on what day of the week does it end if it is an ordinary year? if it is a leap year?

52. 1. How many farthings are there in a penny? in 2 pence? in 5 pence? in 12 pence?

2. How many pence are there in 12 farthings? in 20 farthings? in 36 farthings?

3. How many pence are there in 1 shilling? in 3 shillings? in 5 shillings?

4. How many farthings are there in 1 shilling? in 1 shilling 6 pence? in 1 shilling 9 pence?

5. How many pence are there in 1 shilling 3 pence? in 2 shillings 9 pence? in 3 shillings 6 pence?

6. Reduce 36 pence to shillings; 60 pence; 70 pence; 100 pence; 120 pence.

7. How many shillings are there in 1 pound? how many pence? How many shillings are there in 2 pounds 10 shillings?

8. How many pounds will 60 bushels of apples cost at 3 shillings per bushel?

9. How much will 40 yards of ribbon cost at 1 shilling 3 pence a yard?

10. At 6 pence each how much will 40 melons cost?

11. What part of a pound are 2 shillings 6 pence? 7 shillings 6 pence? 12 shillings 6 pence?

12. A shilling is worth about 24 cents. What is the value in United States money of 1 pound?

13. A man expended 1 pound 10 shillings for oats at 1 shilling 6 pence per bushel. How many bushels did he buy?

14. How much does a man earn in 6 days who gets 5 shillings 8 pence per day? How much would that be in United States money?

53. 1. A grocer bought 100 melons at 30 cents a dozen. How much did they cost him?

2. How many years old is a man whose age is 3 score and 10?

3. How much will a ream of paper cost at 10 cents a quire?

4. A ship sank where the depth of the water was 20 fathoms. How many feet deep was it?

5. The height of a certain horse at the front shoulder was 15 hands. What was its height in feet?

6. A gross of pens was bought for 30 cents and retailed at 2 for 1 cent. What was the gain?

7. How much will 68 cucumbers cost at 24 cents a dozen?

8. A stationer paid \$1.50 for a ream of paper and sold it at 20 cents a quire. How much did he gain?

9. If I buy 6 dozen eggs at 20 cents a dozen, and sell them at 9 for 25 cents, what is my gain?

10. A boy rode 15 miles on a bicycle in 1 hour and 40 minutes. How long, at that rate, would it take him to make a journey of 270 miles?

11. How much must be paid for a ream of paper at $\frac{1}{2}$ a cent a sheet?

12. How many score are there in 50? in 75? in 96?

13. A stationer pays 30 cents per gross for pens, and retails them at 1 cent apiece. How much does he gain per gross?

14. Eggs bought at 15 cents per dozen are sold at 8 for 25 cents. What is the gain on 10 dozen?

15. How much must be paid for 16 quires of paper at $\$2\frac{1}{2}$ per ream?

16. How much must be paid for one gross boxes of crayon, at 10 cents a box?

17. At $\$2.70$ per gross how much must be paid for 96 lead pencils? for 120?

18. Collar buttons bought for 50 cents per gross were sold at 10 cents per dozen. If the gain was $\$7$, how many gross were sold?

54. 1. What is the cost of 3 bushels 3 pecks of oats, at 40 cents per bushel?

2. At 10 cents a quart, what is the cost of 1 peck 6 quarts 1 pint of cranberries?

3. How much will a piece of ribbon 2 yards 2 feet 6 inches long cost, at 12 cents per yard?

4. How much will it cost to build a fence 165 feet long, at $\$12$ per rod?

5. How many weeks are there in the months of July, September, and November?

6. A dealer bought 60 gallons of wine for $\$50$ and retailed it at 20 cents a pint. How much did he gain?

7. Potatoes bought at 60 cents per bushel are retailed at 25 cents per peck. How many bushels must be sold to gain $\$30$?

8. How many days were there in the year 1896, from January 15 to March 20?

9. A lot is 75 feet square. How much will it cost to put a fence around it, at 75 cents a yard?

10. If 1 bushel 3 pecks of chestnuts cost \$5.60, what is the price per bushel?

11. If a train runs $\frac{2}{3}$ of a mile in 48 seconds, what is its rate per hour?

12. If 2 pounds 5 ounces of butter cost 74 cents, what is the price per pound?

13. What is the value of a gold watch case weighing 50 pennyweights, if the gold is worth \$24 per ounce?

14. The circumference of a wheel is very nearly $3\frac{1}{2}$ times its diameter. How many feet will a bicycle having 28-inch wheels go in making 10 revolutions?

15. If 1 bushel of blackberries that cost \$2 is sold at 8 cents per quart, how much is gained?

16. How many bottles, each holding one gill, can be filled with one gallon of turpentine?

17. A merchant buys $2\frac{1}{2}$ dozen handsaws at \$18 per dozen. If he sells them so as to gain 50 cents apiece, how much does he get for them?

18. What will be the cost of 1 bushel 3 pecks 4 quarts of potatoes at 64 cents per bushel?

19. What must be paid a gross for hairpins so that they may be sold at 10 cents per dozen, and 40 cents a gross be gained?

20. A farmer bought 3 tons 9 hundredweight of plaster. After he had used 1 ton 8 hundredweight, what was the value of the remainder at \$20 per ton?

21. A bedroom 6 yards long requires 27 square yards of carpet to cover the floor. How wide is the room?

22. How much must be paid for 3 pecks, 5 quarts of clover seed at \$6.40 per bushel?

23. A train runs from New York to Philadelphia, a distance of 90 miles, in 2 hours 15 minutes. What is its rate per hour?

24. How many square feet are there in a rectangle 2 yards long and 30 inches wide?

25. In a rod there are $5\frac{1}{2}$ yards, and in a mile 320 rods. How many yards are there in a mile?

26. How many months and days are there in $\frac{3}{4}$ of a year? in $\frac{2}{3}$ of a year?

27. What part of a year is 3 months 24 days? 1 month 10 days? 5 months 10 days?

28. At 7 o'clock my clock strikes 11; how many strokes will it strike at 11 o'clock?

29. If a man can earn \$66 in 1 month 20 days, how much does he earn per day, counting 24 working days per month?

30. If an electric car goes 880 feet per minute, how many miles does it go per hour?

31. How much should be charged for a gold ring, weighing 4 pennyweight 12 grains, at \$24 per ounce?

32. How many square yards are there in the walls of a room $16\frac{1}{2}$ feet long, $12\frac{1}{2}$ feet wide, and 10 feet high?

33. How much must be paid for 3 boards, each 16 inches wide and 20 feet long, at 5 cents a square foot?

34. When 2 pounds 14 ounces of beef cost 46 cents, how much must be paid for 1 pound 12 ounces?

35. Having 8 tons 15 hundredweight of coal in my cellar, I burn $\frac{3}{4}$ of it. What is the value of what is left, at \$4 $\frac{1}{2}$ per ton?

36. If a man can walk $1\frac{1}{2}$ miles in 20 minutes, how long will it take him to walk 21 miles?

37. A merchant bought 20 pounds of tea for \$10. He sold $\frac{1}{4}$ of it for $1\frac{1}{2}$ times what it all cost. How much did he get for it per pound?

38. How long a piece of carpet 27 inches wide, will contain exactly 2 square yards?

39. A field 40 rods wide, sold at \$80 per acre, brought \$24.00. How long was the field?

40. Find the number of cubic feet of air in a room 20 feet long, 15 feet wide, and 10 feet high.

41. If a watch gained 1 minute 15 seconds per day, how much did it gain during February 1897?

42. How many flagstones, each 4 feet long and 2 feet wide, will be needed to lay a crossing 120 feet long and 6 feet wide?

43. How much is received for a barrel of apples containing $2\frac{1}{2}$ bushels, if they are sold for 10 cents per half peck?

44. A man divided 9 gallons 2 quarts 1 pint of milk equally among seven poor families. How much did each receive?

45. How many visiting cards, each 2 inches long and $1\frac{1}{4}$ inches wide, can be cut from a piece of cardboard 2 feet 1 inch long and 1 foot 4 inches wide?

46. Each of 7 milk cans contains 8 gallons 2 quarts and 1 pint of milk. How much milk is there in them all?

47. How many 3-inch cubes can be cut from a block of wood 1 foot long, 6 inches wide, and 6 inches thick?

PERCENTAGE

55. 1. What part of anything is 20% of it?

NOTE:—The expression **Per Cent** means *by the hundred*. The sign of **Per Cent** is %.

SOLUTION:—20% of anything is $\frac{20}{100}$, or $\frac{1}{5}$, of it.

2. What part of anything is 5% of it? 25%?
50%? 80%? 75%? 100%?

3. What part of anything is 15% of it? 35%?
45%? 55%? 75%? 95%?

4. What part of anything is $12\frac{1}{2}\%$ of it? $16\frac{2}{3}\%$?
 $33\frac{1}{3}\%$? $37\frac{1}{2}\%$? $62\frac{1}{2}\%$? $87\frac{1}{2}\%$?

SOLUTION:— $12\frac{1}{2}\% = \frac{12\frac{1}{2}}{100} = \frac{25}{200} = \frac{1}{8}$.

5. What is 30% of 60? 25% of 200? 50% of 90?
3% of 300? 40% of 400?

SOLUTION:—30% of anything is $\frac{3}{10}$ of it; therefore 30% of 60 is $\frac{3}{10}$ of 60, or 18.

6. What is $12\frac{1}{2}\%$ of 96? $33\frac{1}{3}\%$ of 900? $37\frac{1}{2}\%$ of
\$48? $87\frac{1}{2}\%$ of \$800? $66\frac{2}{3}\%$ of 300?

7. A gain of 25% was made on an investment of
\$480. How much was gained?

8. I paid \$180 for a horse, and sold it at a gain of
35%. How much was gained?

9. How much is $\frac{3}{4}\%$ of \$4800?

SOLUTION:—1% or $\frac{1}{100}$ of \$4800 is \$48, hence $\frac{3}{4}\%$ of \$4800 is $\frac{3}{4}$ of \$48, or \$36.

Therefore $\frac{3}{4}\%$ of \$4800 is \$36.

10. How much is $\frac{2}{3}\%$ of \$6600? $\frac{1}{4}\%$ of \$800? $\frac{5}{8}\%$ of \$8800? $\frac{3}{5}\%$ of 600 bushels?

11. How much is $1\frac{1}{2}\%$ of \$3600? $1\frac{2}{3}\%$ of 900 tons? $2\frac{1}{2}\%$ of \$900? $3\frac{1}{3}\%$ of 3000 pounds?

12. Of \$250 deposited in a bank, 8% was withdrawn. How much was withdrawn?

13. A farmer raised 375 bushels of potatoes, and reserved 8% of them for his own use. How many bushels were reserved?

14. Wood bought at \$5 a cord was sold at a gain of 40%. How much was gained on each cord?

15. A man lost by a sale $37\frac{1}{2}\%$ of the value of a horse that cost him \$240. How much did he lose?

16. If $62\frac{1}{2}\%$ of \$400 is $\frac{1}{4}$ of the cost of a coach, how much does it cost?

17. A man who earns \$250 a month, regularly puts 25% of it in a savings bank. How much does he put in the bank in a year?

18. I bought 6 horses at \$180 each, and sold them at a gain of $33\frac{1}{3}\%$. How much was gained on all?

19. Which is the better and how much, to sell \$400 worth of goods at 30% profit, or \$3000 worth at 5% profit?

20. Having \$300, I paid 30% for board, 20% for clothing, and 15% for other expenses. How many dollars were there remaining?

56. 1. What per cent of anything is $\frac{3}{8}$ of it?

SOLUTION:—The whole of anything is $\frac{8}{8}$ or 100% of it; hence $\frac{3}{8}$ of it is $\frac{3}{8}$ of 100% of it, or $37\frac{1}{2}\%$.

2. What per cent of a number is $\frac{1}{4}$ of it? $\frac{1}{10}$? $\frac{1}{2}$? $\frac{1}{5}$? $\frac{3}{8}$? $\frac{3}{4}$? $\frac{4}{5}$?

3. What per cent of my income is $\frac{1}{12}$ of it? $\frac{1}{6}$? $\frac{1}{8}$? $\frac{3}{8}$? $\frac{1}{9}$? $\frac{5}{8}$? $\frac{2}{3}$? $\frac{7}{8}$?

4. If a boy lost $\frac{3}{8}$ of his marbles, what per cent did he lose? What per cent had he left?

5. A man expended $\frac{1}{3}$ of his money for a hat, and the remainder for an overcoat. What per cent of his money did each cost?

6. After $\frac{1}{3}$ of a crop of potatoes had been spoiled, $\frac{3}{4}$ of the remainder was sold, and the rest reserved for seed. What per cent was sold, and what per cent was reserved for seed?

7. What part of \$8 is \$5? How many hundredths of \$8 is \$5? What per cent of \$8 is \$5?

SOLUTION:—Since \$5 is $\frac{5}{8}$ of \$8, \$5 is $\frac{62\frac{1}{2}}{100}$, or $62\frac{1}{2}\%$ of \$8. Therefore, etc.

8. What part of 12 is 3? What per cent of 12 is 3? of 15 is 5? of 20 is 4? of 24 is 18?

9. What part of 25 is 15? What per cent of 25 is 15? of 35 is 25? of 45 is 35? of 75 is 65?

10. What per cent of 2 is 4? of 6 is 9? of 10 is 14? of 8 is 20? of 9 is 12?

11. What per cent of $\frac{3}{4}$ is $\frac{1}{2}$? of $\frac{4}{5}$ is $\frac{3}{5}$? of $\frac{3}{4}$ is $\frac{3}{8}$? of $\frac{3}{4}$ is $\frac{2}{3}$? of $\frac{5}{8}$ is $\frac{1}{3}$?

SUGGESTION:—Reduce the fractions to fractions having a common denominator.

12. What per cent of $2\frac{1}{2}$ is $1\frac{1}{2}$? of $3\frac{1}{2}$ is $2\frac{1}{2}$? of $2\frac{3}{8}$ is $1\frac{3}{8}$? of 4 is $2\frac{3}{4}$? of $3\frac{3}{4}$ is $1\frac{1}{4}$?

13. A coat that cost \$25 was sold for \$45. What was the gain per cent?

NOTE:—The gain or loss is always computed as a certain part or per cent of the *cost*.

14. A drover bought six horses for \$900, and sold them at \$225 each. Find the gain per cent.

15. A boat was rowed 150 miles down a river, and was carried by the current 50 miles farther. What per cent of the entire distance was due to the current, and what per cent to the rowing?

16. I sold a wagon for \$200, thereby gaining \$50. What was the cost? What was the gain per cent?

17. An apple dealer bought a lot of apples at 4 for 3 cents and sold them at 4 for 5 cents. What was his gain per cent?

18. A watch was sold for \$150, which was $1\frac{1}{4}$ times its cost. Find the gain per cent.

19. A dozen overcoats were sold for \$400. If they cost \$25 each, what per cent was gained?

20. A hardware dealer gets for 2 bicycles exactly what 3 cost him. What is his gain per cent?

21. Eggs bought at 15 cents a dozen are sold at 10 for 25 cents. What per cent is gained?

22. A merchant bought 150 barrels of flour. He sold 20% of it at cost and on the remainder he gained 40%. What per cent did he gain on the whole?

57. 1. By selling a horse for \$40 more than it cost, a man gained 20%. How much did the horse cost?

SOLUTION:—\$40 was 20%, or $\frac{1}{5}$, the cost of the horse; hence the cost of the horse was 5 times \$40, or \$200. Therefore, etc.

2. On hay sold at \$11 per ton there was a profit of $37\frac{1}{2}\%$. How much did it cost?

SUGGESTION:—Since the hay was sold at a profit of $37\frac{1}{2}\%$, or $\frac{3}{8}$ of the cost, the selling price was $\frac{11}{8}$ of the cost.

3. A man sold his watch for \$60, and by so doing lost 25%. How much did it cost him?

SUGGESTION:—Since he lost 25%, or $\frac{1}{4}$, of the cost, he sold it for $\frac{3}{4}$ of the cost.

4. A farmer sold $62\frac{1}{2}\%$ of his land, and had 120 acres left. How many acres did he own at first?

5. If 60% of the coal in my cellar is $18\frac{3}{4}$ tons, how many tons are there?

6. A student sold his books for \$90, which was at a loss of 25%. How much did they cost him?

7. A sold a horse to B at a gain of 20%, and B sold it to C for \$198, which was at a gain of 10%. How much did A pay for the horse?

8. A horse and carriage were sold for 85% of their cost, by which there was a loss of \$75. How much did they cost?

9. By reducing ribbon from 40 cents to 35 cents a yard, a merchant diminished his gain by 20%. How much did it cost him per yard?

10. A coal merchant raised the price of coal 60 cents per ton, and by so doing he gained 50% instead of $33\frac{1}{3}\%$. How much did the coal cost him per ton?

11. After 15% of a regiment of soldiers has been killed there are 680 left. How many men were in the regiment at first?

12. By selling cloth at $\$2\frac{1}{2}$ per yard a merchant lost $16\frac{2}{3}\%$. For how much must he sell it to gain $16\frac{2}{3}\%$?

13. If my expenses were increased $12\frac{1}{2}\%$, my monthly savings would be \$20 less than they are. How much do I get a month, if I save 75% as much as I spend?

14. A man paid \$60 for a watch, which was 20% less than its value, and he sold it for 20% more than its value. What per cent did he gain?

15. A jeweler sold 2 watches at \$60 each; on one he lost 20%, and on the other he gained 20%. Did he gain or lose by the transaction, and how much?

16. By selling a piano for 40% less than the catalogue price, a dealer made a profit of 25%. How much did it cost him, if the catalogue price was \$500?

17. A drover sold two horses at \$120 apiece. On one he gained 20%, and on the other he lost $33\frac{1}{3}\%$. How much did he gain or lose by the transaction?

18. Some furniture was bought for $16\frac{2}{3}\%$ less than its value, and sold for $16\frac{2}{3}\%$ more than its value. What was its value, if the difference between the cost and the selling price was \$60?

19. A dealer sold 120 barrels of flour for \$792, which was 12% less than he paid for it. How much did it cost per barrel?

20. Two persons commenced business with equal capital. One gained 25%, the other 37%. What was their capital if the difference between their gains was \$1080?

58. 1. An agent sells goods for \$800, and gets 5% commission for selling them. How much does he receive for his services?

SOLUTION:—At a commission of 5% the agent receives $\frac{1}{20}$, or $\frac{1}{20}$, of the amount of the sale. $\frac{1}{20}$ of \$800 is \$40. Therefore, etc.

2. A collector gets 8% commission and collects \$5000. How much does he get for his services?

3. Mr. Brown paid $12\frac{1}{2}\%$ for the collection of a note for \$8000. How much did he pay?

4. An agent sold a house for \$9500, receiving 2% commission for selling it. How much did he receive for his services?

5. A commission of $\frac{3}{4}\%$ was allowed an agent for selling \$6000 worth of cotton. How much did the agent receive, and how much the owner of the cotton?

6. A lawyer secured a judgment of \$7500 against a railroad company, for damages to a client. The lawyer was to receive 20% for his services. How much was left for the client?

7. A broker sold for a customer railroad stock whose face or par value was \$20,000, at a commission of $\frac{1}{8}\%$. Find his commission.

NOTE:—Commission of a broker, or brokerage, is computed upon the face or *par value* of the securities bought or sold.

8. A Western bank charged $\frac{3}{4}\%$ for collecting a draft on New York for \$1200. How much was the charge?

9. An auctioneer sold goods to the amount of \$2400 at a commission of $2\frac{1}{2}\%$. What was his commission?

10. A traveling salesman received a commission of 10% on his sales. His average monthly sales during 1896 amounted to \$1250. Find his commission for the year.

11. A miller takes 10% toll for grinding wheat. How much does his mill earn in 6 days, if it grinds 450 bushels per day, and if wheat is worth \$1 per bushel?

12. An agent's commission at $1\frac{1}{2}\%$ for selling a house amounted to \$300. How much was received for the house?

SOLUTION:— $1\frac{1}{2}\%$, or $\frac{3}{20}$, of the value of the house is therefore \$300; $\frac{3}{20}$ of it is \$100; and the value of the house is 200 times \$100, or \$20,000. Therefore, etc.

13. A collector whose commission was 5% paid in, after deducting his commission, \$38,000. How much was his commission?

SUGGESTION:—He paid in only 95% of the amount collected.

14. A broker sold bonds on which his commission at $\frac{3}{8}\%$ was \$375. What was the par value of the bonds?

15. An agent sold cotton on a commission of $6\frac{1}{4}\%$. If the owner received \$4500, what was the agent's commission?

16. I sent my agent \$8400, with which to purchase goods after deducting his commission of 5%. How much was expended for goods?

SUGGESTION:—Since the agent receives for his services 5% or $\frac{1}{20}$ of the sum expended for goods, and since \$8400 includes the sum expended for goods and his commission, \$8400 must be $\frac{19}{20}$ of the sum expended for goods.

17. An agent received \$648 with which to purchase hogs at \$6 each, after his commission of 8% for purchasing was deducted. How many could he buy?

18. I sent a broker \$6200 to invest in the stock of a sugar refining company, after deducting his commission of $3\frac{1}{2}\%$. How much was his commission?

19. How many bushels of wheat at 80 cents a bushel can an agent purchase with \$8100, after deducting his commission of $1\frac{1}{4}\%$?

20. How many shares of stock at \$25 per share can a broker pay for with \$5200, if he deducts a commission or brokerage of 4%?

59. 1. How much must be paid for an insurance policy for \$2000 on a house, if the premium is $1\frac{1}{2}\%$?

SOLUTION:—Since a premium of $1\frac{1}{2}\%$ is paid, the premium is $1\frac{1}{2}\%$ or $\frac{3}{20}$ of the policy. $\frac{3}{20}$ of \$2000 is \$30. Therefore, etc.

2. How much will it cost to insure a ship for \$60,000, at 2% premium?

3. A farmer insures his barn for \$3500, paying a premium of 2%. How much does the insurance cost?

4. A man owns $\frac{1}{5}$ of a ship that is worth \$100,000. He insures his share at a premium of $1\frac{3}{4}\%$. How much is the premium?

5. A merchant insures his goods for \$5000, paying a premium of $2\frac{1}{5}\%$. How much does the insurance cost?

6. Find the cost of an insurance policy for \$4500 at $1\frac{2}{5}\%$ premium.

7. A house worth \$18,000 is insured for $\frac{5}{8}$ of its value at $1\frac{2}{3}\%$ premium. What is the cost of insuring it?

8. A ship worth \$50,000 is insured for $\frac{4}{5}$ of its value at 3% premium. If the ship is wrecked, how much do the owners lose, including the premium?

9. It cost \$90 to insure my house for $\frac{3}{4}$ of its value, at a premium of $1\frac{1}{2}\%$. What was its value?

SUGGESTION:—\$90 was $\frac{3}{4}$ of the sum required to insure the house at its full value at the given rate.

10. The premium at $\frac{1}{5}$ of 1% for insuring some goods is \$20. What is the amount of the policy?

11. A house worth \$12,000 is insured for $\frac{3}{4}$ of its value, at a cost of \$150. What is the rate of premium?

12. A and B insure goods for \$3400 at 2% premium. What premium should each pay if $\frac{2}{3}$ of A's share of the goods equals $\frac{3}{4}$ of B's share?

13. If \$120 was paid for insuring horses worth \$80 apiece at $1\frac{1}{2}\%$ premium, how many horses were there?

60. 1. What is the interest of \$300 for 1 year at 6%?

SOLUTION:—The interest for 1 year at 6% is $\frac{6}{100}$ of the principal. $\frac{6}{100}$ of \$300 is \$18. Therefore, the interest of \$300 for 1 year at 6% is \$18.

NOTE:—In computing interest, a year is generally assumed to be 12 months, and a month 30 days.

In the following examples those divisions of the year and month will be adopted.

1. Find the interest of :

- | | |
|-----------------------------|-----------------------------|
| 2. \$400 for 1 year at 4%. | 6. \$500 for 1 year at 7%. |
| 3. \$800 for 1 year at 10%. | 7. \$200 for 1 year at 12%. |
| 4. \$600 for 1 year at 8%. | 8. \$100 for 1 year at 11%. |
| 5. \$300 for 1 year at 5%. | 9. \$900 for 1 year at 6%. |

10. \$150 for 1 year at 4%.
11. \$750 for 1 year at 8%.
12. \$800 for 2 years at $5\frac{1}{2}\%$.
13. \$150 for 4 years at $4\frac{1}{2}\%$.
14. \$400 for $3\frac{1}{2}$ years at 4%.
15. \$250 for 2 years at 6%.
16. \$300 for $2\frac{1}{2}$ years at 8%.
17. \$750 for 4 years at 5%.
18. \$175 for 5 years at 5%.
19. \$350 for $3\frac{2}{3}$ years at 6%.

To what part of the principal is the interest equal:

20. In 2 years 5 months at 6%?

SOLUTION:—2 years 5 months are $2\frac{5}{12}$ years, or $\frac{29}{12}$ of a year. At 6% for 1 year, the interest is $\frac{3}{10}$ of the principal, and for $\frac{29}{12}$ of a year $\frac{29}{12}$ times $\frac{3}{10}$, or $\frac{29}{40}$, of the principal. Therefore, etc.

21. In 2 years 6 months at 4%?
22. In 3 years 4 months at 9%?
23. In 4 years 2 months at 6%?
24. In 2 years 8 months at $3\frac{1}{2}\%$?
25. In 3 years 3 months at 5%?
26. In 8 years 7 months at 4%?
27. In 1 year 10 months at 3%?
28. In 2 years 5 months 18 days at 5%?

SOLUTION:—18 days are $\frac{3}{8}$ of a month. Therefore 5 mo 18 da. equal $5\frac{3}{8}$ months or $\frac{45}{8}$ months. Since 1 month = $\frac{1}{12}$ year, $\frac{45}{8}$ months = $\frac{15}{8}$ or $1\frac{7}{8}$ year. Therefore 2 yr. 5 mo. 18 da. = $2\frac{15}{8}$ years, or $\frac{31}{4}$ years.

At 5% the interest for 1 year equals $\frac{1}{4}$ of the principal, and for $\frac{31}{4}$ years $\frac{31}{4}$ of $\frac{1}{4}$, or $\frac{31}{16}$, of the principal. Therefore, etc.

To what part of the principal is the interest equal :

29. In 3 yr. 6 mo. 15 da. at 4% ?

30. In 1 yr. 5 mo. 20 da. at 9% ?

31. In 2 yr. 4 mo. 12 da. at 5% ?

32. In 4 yr. 5 mo. 10 da. at 3% ?

33. In 5 yr. 3 mo. 24 da. at 12% ?

34. In 2 yr. 1 mo. 5 da. at 8% ?

35. In 3 yr. 3 mo. 3 da. at 10% ?

36. In 2 yr. 5 mo. 15 da. at 6% ?

37. What is the interest of \$1000 for 60 days at 6% ?

SOLUTION:— At 6% the interest for 1 year equals $\frac{1}{16}$ of the principal. Since 60 days are considered $\frac{1}{4}$ of a year, the interest for 60 days is $\frac{1}{64}$ of the principal; $\frac{1}{64}$ of \$1000 is \$15.625. Therefore, etc.

What is the interest of :

38. \$8750 for 60 da. at 6% ?

39. \$3600 for 30 da. at 6% ?

40. \$5000 for 60 da. at 3% ?

41. \$6000 for 90 da. at 4% ?

42. \$4000 for 30 da. at 9% ?

43. \$4800 for 30 da. at 5% ?

44. \$6600 for 90 da. at 8% ?

45. \$1200 for 60 da. at 7% ?

46. \$3000 for 90 da. at 6% ?

47. \$2450 for 30 da. at 6% ?

48. \$36.80 for 90 da. at 9% ?

61. 1. What is the amount of \$2400 for 2 yr. 6 mo. at 6%?

SOLUTION:— At 6%, the interest of any sum for 2 yr. 6 mo. is $\frac{1}{10}$, or $\frac{3}{20}$, of the principal, and the amount for the same time is $\frac{23}{20}$ of the principal. $\frac{23}{20}$ of \$2400 is \$2760. Therefore, etc.

What is the amount of:

2. \$3600 for 5 yr. at 5%?
3. \$120 for 6 yr. 3 mo. at 4%?
4. \$300 for 5 yr. 6 mo. at 6%?
5. \$4000 for 3 yr. 3 mo. at 8%?
6. \$640 for 2 yr. 6 mo. at 5%?
7. \$800 for 1 yr. 5 mo. at 12%?
8. \$1000 for 3 yr. 8 mo. at 3%?
9. \$6000 for 3 yr. 3 mo. 15 da. at 8%?
10. \$400 for 1 yr. 1 mo. 24 da. at 5%?
11. \$240 for 60 da. at 6%?
12. \$900 for 90 da. at 8%?
13. \$6000 for 30 da. at 4%?
14. \$4800 for 45 da. at 4%?
15. \$3200 for 75 da. at 5%?
16. \$3000 for 5 yr. 4 mo. 18 da. at 4%?
17. \$1200 for 3 yr. 3 mo. 10 da. at 6%?
18. \$1500 for 2 yr. 6 mo. 20 da. at 3%?
19. Divide the amount of \$1000 for 3 yr. at 5%, between A and B, so that A's share shall be $\frac{2}{3}$ of B's.
20. A and B wish to divide the amount of \$5000 for 4 years, at 5%, into two parts, so that A may have twice as much as B. Find their shares.

21. The amount of my money for 2 years and 6 months at 6% is \$250 less than the amount for 4 years at 5%. How much have I?

SUGGESTION:—The amount of my money in 2 yr. 6 mo. at 6% will be $\frac{3}{8}$ of the principal, and for 4 yr. at 6% $\frac{1}{2}$ of the principal.

22. My brother and I had together \$3000 at interest for 4 years 6 months at 4%. If the interest was divided so that his share was twice mine, how much did each receive?

23. I gave a note for \$8000, which I paid 3 years 6 months afterwards, with interest at $4\frac{1}{2}\%$. What was the amount due?

62. 1. What principal will yield \$96 interest in 2 years 8 months at 6%?

SOLUTION:—The interest of any sum for 2 yr. 8 mo. at 6% is $\frac{1}{10}$ of the principal. Hence \$96 is $\frac{1}{10}$ of the principal; $\frac{1}{10}$ of the principal is $\frac{1}{10}$ of \$96, which is \$6, and the principal is 100 times \$6, or \$600. Therefore, etc.

2. What principal will in 3 years 9 months at 4% yield \$150 interest?

3. Find the principal that will yield \$680 interest in 8 months 15 days at 6%.

4. What principal will yield \$45.75 interest in 60 days at 6%?

5. What principal will yield \$65 interest in 30 days at 6%?

6. What principal at 4% yields \$150 interest in 90 days?

7. What principal will yield \$13.20 interest in 2 years 9 months at 4%?

8. How much do I owe, if in 3 years 3 months 15 days, the interest on the debt at 8% is \$158?

9. A and B put at interest equal sums of money. A's money, in 3 years 5 months at 6%, yields \$81 less interest than B's in 4 years 3 months at 8%. How much had each on interest?

10. The interest of a sum for 6 years at 5% is \$600 more than its interest for 3 years at 6%. Find the sum.

11. Two sons inherited equal sums of money. One put $\frac{2}{3}$ of his money at interest, the other $\frac{3}{4}$ of his, each at 6%. In 2 years 8 months their combined interest was \$2720. How much did each inherit?

SUGGESTION:—If each had put all his money at interest at the given rate, the interest of each would have been $\frac{1}{100}$ of the sum inherited. But since one invested only $\frac{2}{3}$ of his money, his interest was only $\frac{2}{3}$ of $\frac{1}{100}$, or $\frac{1}{150}$, of the inheritance, and since the second invested only $\frac{3}{4}$ of his, his interest was only $\frac{3}{4}$ of $\frac{1}{100}$, or $\frac{1}{133\frac{1}{3}}$, of his inheritance.

12. The money paid for a horse and wagon will, in 1 year 8 months at 6%, yield \$32 interest. How much was paid for each if $\frac{2}{3}$ of the cost of the wagon was $\frac{2}{3}$ the cost of the horse?

13. A merchant who cleared 12% annually on his investment was forced by poor health to give up his business and to lend his money at 7%. His income was thus reduced \$6800 in 2 years 3 months and 6 days. What was his investment?

14. On April 15, 1897, a man bought 400 sheep and gave in payment his note on interest at 6%. When he paid the note on June 30, 1897, the interest was \$25. How much did the sheep cost per head?

63. 1. What principal will in 2 years 10 months at 6% amount to \$585?

SOLUTION:—The interest of any sum for 2 yr. 10 mo. at 6% is $\frac{11}{100}$ of the principal, and the amount for that time equals $\frac{111}{100}$ of the principal. Hence, \$585 is $\frac{111}{100}$ of the principal; $\frac{100}{111}$ of the principal is $\frac{100}{111}$ of \$585, which is \$5; and the principal is 100 times \$5, or \$500. Therefore, etc.

2. What principal will amount to \$342 in 3 years 6 months at 4%?

3. What sum will in 90 days at 4% amount to \$8888?

4. What sum will in 60 days at 6% amount to \$2020?

5. A man borrowed a sum of money at 6%, for 3 years 8 months 20 days. At the end of the time he owed \$3670. How much did he borrow?

6. A loaned some money to a friend for 6 months 20 days at 10%. At the end of the time the entire debt was \$3800. How much was loaned?

7. A's money is twice B's, and the amount of their money for 3 years 5 months 10 days at 6% is \$3620. How much has each?

8. If $\frac{3}{8}$ of M's money is equal to $\frac{3}{4}$ of N's, and the amount of their money at interest for 1 year 8 months at 6% will be \$18,700, how much has each?

9. A's money is $\frac{4}{5}$ of B's, and $\frac{1}{2}$ of their money at interest for 2 years 3 months at 4% amounts to \$1199. How much has each?

10. If the amount of \$10,000 for 3 years 9 months at 8% is divided into two parts that are to each other as 8 to 5, it will give respectively $\frac{1}{2}$ of A's money and $\frac{2}{3}$ of B's. How much has each?

64. 1. In what time will \$300 at 5% yield \$80 interest?

SOLUTION:—In one year, at 5%, the interest on \$300 is \$15. To yield \$80 interest, will require as many years as \$15 is contained times in \$80, or $5\frac{1}{3}$ years. The time is, therefore, 5 years 4 months.

2. In what time will \$500 at 6% yield \$120 interest?

3. In what time at 6% will \$8000 yield \$80 interest?

4. In what time at 4% will \$6500 yield \$65 interest?

5. A note for \$3000 at 5% was not paid until the interest was \$400. How long did it run?

6. A pawnbroker loaned \$50 on a watch, charging 12% interest. The watch was redeemed when the interest was \$11. How long was it in pawn?

7. In what time at 8% will \$90 yield \$36 interest?

8. In what time will \$180 at 5% yield \$30 interest?

9. The amount of \$800 for a certain time at 7% is \$1080. Find the time.

10. A certain principal doubled itself at 6%. How long was it at interest?

SUGGESTION:—The annual interest is $\frac{6}{100}$ of the principal and the entire interest $\frac{100}{100}$ of the principal.

11. In what time will a principal double itself at 5%? at 8%? at 4%? at 20%? at 25%?

12. In what time will a principal treble itself at 10%? at 12%? at 5%? at 40%? at 50%?

13. A debt to be paid after a certain time will amount with interest at 5% to \$750, and with interest at 8% to \$840. Find the debt and the time.

SUGGESTION:—The interest of the debt for the whole time at 3% = \$840 - \$750.

65. 1. At what rate per cent will \$60 in 3 years 6 months yield \$12.60 interest?

SOLUTION:— At 1%, the interest of \$60 in 3 years 6 months is \$2.10; and to yield \$12.60 interest, the rate must be as many times 1% as \$2.10 is contained times in \$12.60, or 6 times. The rate is, therefore, 6%.

2. At what rate will \$90 in 5 years yield \$18 interest?

3. What is the rate, if the principal is \$200, the time 6 years, and the interest \$90?

4. At what rate will \$300 in 2 years 8 months yield \$72 interest?

5. At what rate will \$5000 in 90 days yield \$50 interest?

6. The time being 60 days, the principal \$8100, and the interest \$81, what is the rate?

7. At what rate per cent will \$600 in 5 years yield \$135 interest?

8. At what rate per cent will \$750 in 2 years 7 months 6 days yield \$195 interest?

9. At what rate per cent will \$1600 in 2 years 3 months 15 days yield \$440 interest?

10. At what rate per cent will \$1200 in $4\frac{1}{2}$ years amount to \$1416?

11. When the principal is \$775, the amount \$930, and the time 3 years 4 months, what is the rate?

12. The amount of a certain principal for 5 years at a certain rate is \$665, and for 8 years at the same rate it is \$779. What are the rate and the principal?

66. 1. A man gets \$75 per month, and saves 20% of it. How much does he save in a year?

2. I bought 80 bushels of potatoes at 50 cents a bushel; 25% of them were unsalable, but the rest were sold so that $12\frac{1}{2}\%$ was gained by the transaction. How much did they sell for per bushel?

3. Two coats were sold at \$30 each. On one 20% was gained; on the other 20% was lost. How much was the gain or loss?

4. By selling a horse for \$180, I gain 20%. For what price should I sell it to gain $33\frac{1}{3}\%$?

5. What per cent discount does a piano dealer allow who gives a discount of 25%, and a further discount of 20% from the remainder?

6. How much was paid for a piano catalogued at \$600, if a discount of 30% was deducted, and another discount of 20% from what remained?

7. A merchant sold cloth at \$2.40 per yard, thereby gaining 20%. Later he marked it down so that he lost 25%. What was the second selling price?

8. A man paid 20% of his money for a house, and 30% of the remainder for a store. How much did each cost if he paid \$200 more for the store than for the house?

9. At what rate per cent will a principal double itself in 16 years 8 months?

10. The amount of a certain principal at a certain rate for 3 years is \$552, and for 7 years, \$648. Find the principal and the rate.

11. My grocer gets 20% of my annual salary, and my butcher 10% of the remainder. What is my salary, if my grocer gets \$600 more than my butcher?

12. A farmer raised wheat and rye in quantities such that 40% of his wheat was equal to 75% of his rye, and of both he had 4600 bushels. How many bushels of each did he raise?

13. How much money has A, if 40% of his money is in coin, 30% of it is in bills, and the remainder, which is \$900, is loaned?

14. A sold a horse to B at a loss of 20%; B sold it to C for \$150, and by so doing lost 25%. How much did A pay for the horse?

15. Mr. Brown sold his horse so that 75% of what he paid for it was equal to 60% of the selling price. Did he gain or lose, and what per cent?

16. A dealer wishes to mark the price of a piano so that after allowing to the buyer a discount of 20%, and also 20% of the remainder, he may get \$320 for it. Find the marked price.

17. How must a coat that cost \$30 be marked so that there may be a profit of 20% after a discount of 10% from the marked price has been allowed?

18. If a dealer in tea always gets for 3 pounds of tea as much as 4 pounds cost, what per cent does he gain?

19. How many sheep at \$5 each must I buy, so that if I sell them at a gain of 20% I may make a profit of \$25?

20. By selling a bale of goods for \$80 less than cost, there was a loss of 10%. For how much should it have been sold to gain 25%?

21. A mixture of equal parts of two kinds of coffee, costing 18 and 22 cents per pound, was sold so as to gain 25%. What was the selling price per pound?

22. A drover has horses, oxen, and sheep, in all 1840. How many of each kind has he if the number of oxen is 60% of the number of sheep, and the number of horses 40% of the number of oxen?

23. There is a number such that 30% of $\frac{1}{2}$ the number is 27 less than 40% of $\frac{3}{4}$ of it. Find the number.

24. In a mixture of two kinds of tea, 60% of it cost 40 cents a pound, and the remainder 50 cents a pound. For what price per pound should it be sold to gain 25%?

25. A boy had some marbles of which he lost 20%. He then purchased a number equal to 50% of what he had left, after which he had 72. How many had he at first?

26. If a ton of hay is bought for 80% of the market price and sold at a gain of $37\frac{1}{2}\%$, at what per cent above the market price is it sold?

27. A and B engage in trade, A furnishing 60% of the capital, and B the rest. At the end of the year, after a gain of 25%, the capital and gain amount to \$2000. What is each man's share of the gain?

28. After expending \$40 more than 40% of his money, a clerk has \$140 left. How much had he at first?

29. I marked cloth to sell at a gain of 40%, but on account of using an incorrect yard measure I gained only 30%. What is the length of the measure?

30. I pay \$48 for insuring my house worth \$8000 at $\frac{1}{2}\%$. What part of the house is insured?

31. How much money should I send my agent that he may buy 2000 pounds of tea at 35 cents a pound and retain his commission of 4% of the sum invested?

32. A dealer in machinery asked for a reaper 30% more than it cost. He finally took 10% less than his asking price, and gained \$34. How much did he ask?

33. An article exposed to damp air absorbed 6 ounces of water. It then weighed 5 pounds. What per cent of its weight was the water absorbed?

34. What per cent above cost must a man mark his goods in order that he may take off 10% from the marked price and still make 20% on the cost?

35. A merchant sent an agent \$5114 with which to buy goods. The agent was to deduct \$14 for freight, and 2% commission. What was the value of the goods?

36. For what must goods worth \$1940 be insured at 3% so that in case of loss the value of the goods and the premium may be recovered?

37. A man has an income equal to 20% of his capital. He pays for taxes and insurance \$150, which is 3% of his income. What is his capital?

38. A sold B a horse, which cost him \$160, at $12\frac{1}{2}\%$ profit. B sold it to C at a profit of 10%. What would have been A's per cent of profit if he had sold it to C for the price C paid?

39. If 20 gallons of water are added to 120 gallons of milk, what per cent of the mixture is each?

40. Find the rate of gain or loss when $\frac{3}{4}$ of a barrel of sugar is sold for $\frac{4}{5}$ of its cost.

41. If a house costs me \$4000 when money is worth 8% and my taxes and insurance amount to 4%, how much does the use of the house actually cost me each year?

42. Mr. Jones insured his house and furniture for $\frac{3}{4}$ of its value at 2%, and paid a premium of \$48. What was the value of each, if the furniture was worth $\frac{2}{3}$ as much as the house?

43. A note dated July 15, 1896, was paid Oct. 30, 1897, with 8% interest. If the amount was \$6620, what was the face of the note?

44. An insolvent debtor was able to pay 70 cents on the dollar. He owed A \$6000. What was A's total loss, if he allowed the debtor 2% for immediate payment?

45. An article is marked to gain 40%, but the salesman gives a discount of 10%. A collector is afterwards paid 10% of the debt for collecting it. What per cent does the merchant gain?

46. If I ask for a horse 20% more than he cost me, but afterwards make a deduction of 10% from my asking price, and thus receive \$162, how much did the horse cost me?

47. A man had a farm for which he paid \$1200. He sold it for \$1300, but becoming dissatisfied with his sale he bought the farm back for \$1500. What per cent did he lose by the double transaction?

48. The sum of 10% of a number and 5% of half the remainder is what per cent of a quarter of the number?

49. How much is gained on a bicycle listed at \$48, bought at 10% discount, and sold at 25% above the list price?

50. An agent charged 4% commission and \$34 expenses for selling a farm, and sent the owner \$1166. What was the selling price of the farm?

51. A merchant deducts 20% from the marked price of his goods and still makes a profit of 20%. At what advance on the cost are the goods marked?

52. A and B each invest \$4000 in business. At the end of the year A has gained $5\frac{2}{3}\%$, and B has lost $4\frac{2}{3}\%$. How much has each at the end of the year?

53. A farmer's crop of potatoes last year was 5% more than it was this year. How many bushels did he raise this year, if in the two years he raised 615 bushels?

54. A lady's cloak cost \$36. The making cost 25% less than the cloth, and the trimmings 25% more than the cloth. How much did each cost?

55. A grocer buys goods to the amount of \$12,000. For how much does he sell them if he realizes 20% profit, allowing 4% of the sales for bad debts?

56. A merchant charges 1% a month for overdue accounts. Mr. Jones owes him an account of \$540 which is 8 months overdue. How much will Mr. Jones have to pay to settle his account?

57. My store is valued at \$2500, and the goods at \$2000. If I insure the whole for $\frac{2}{3}$ of their value at $\frac{3}{4}\%$, what is my annual premium?

58. A certain principal in 2 years 3 months and 18 days at 6% amounts to \$5380. In how many years more will it amount to \$6400?

59. A man bought a farm for \$8000 and paid \$3000 cash, the balance of the cost remaining on mortgage at 6%. If the net income from the farm was \$500 per annum, what rate of interest did he obtain for his money?

60. A man having \$4800 in a bank drew out 25% of it at one time, and 50% of the remainder at another, and then deposited a sum equal to 120% of what he had drawn out. How much did he then have in the bank?

61. A merchant began business with a certain capital which he increased the first year 20%; on this capital he gained the second year 25%; and the third year he gained on the previous year 40%, when he was worth \$21,000. With what capital did he begin?

62. A miller had 50 barrels of flour worth \$6 per barrel; but 10 barrels were destroyed by being wet. How much should he receive per barrel for the remainder to clear 8% on the cost of the whole quantity?

63. A widow received 40% of her husband's estate, and her daughter 26% of it, the widow securing \$4200 more than the daughter. Find each one's share and the value of the estate.

64. An agent purchased \$4000 worth of goods on 5% commission. His employer changing his business, telegraphed the agent to sell the goods. The agent sold them at 5% less than the first cost on 5% commission. How much was lost by the transaction?

MISCELLANEOUS PROBLEMS

67. 1. If $\frac{1}{2}$ of A's money is increased by $\frac{2}{3}$ of his money, the sum is \$5600. How much has he?

2. Of a flock of sheep, $\frac{1}{2}$ was sold at one time, and $\frac{3}{4}$ of the remainder at another time; there were then left 50 sheep. How many were there at first?

3. If $3\frac{1}{2}$ yards of ribbon cost 30 cents more than $2\frac{2}{3}$ yards, how much did it cost per yard?

4. A man has in his cellar $5\frac{3}{8}$ tons of coal. When there are only $4\frac{1}{8}$ tons left, what part of the coal has been used?

5. Eggs bought at 18 cents per dozen are sold at 10 for 25 cents. How many must be sold to gain \$12?

6. If 3 apples are worth 2 lemons, and 3 lemons are worth 2 oranges, how many apples are worth 20 oranges?

7. If $\frac{3}{4}$ of a ton of hay lasts a horse $\frac{1}{2}$ a month, how long will $1\frac{1}{4}$ tons last him?

8. When $\frac{2}{3}$ of $\frac{3}{4}$ of A's money is equal to twice B's, how much has each if A has \$5000 more than B?

9. A man can row 10 miles an hour down a stream, and 6 miles an hour up the stream. How swift is the current?

10. How far may a man ride from home on a bicycle, at 9 miles per hour, and walk back at 3 miles per hour, so as to be gone 9 hours?

11. When $\frac{3}{4}$ of a pound of pork costs as much as $\frac{1}{2}$ a pound of beef, how much does each cost per pound if 3 pounds of pork and 4 pounds of beef together cost 99 cents?

12. If 3 men can do a piece of work in 8 days, how many men can do it in 6 days?

13. One pipe can fill a cistern in 4 hours, and a second pipe can fill it in 6 hours. How long will it take both running together to fill it?

14. A seamstress can make a dress in 3 days, but with the assistance of her sister, she can make it in 2 days. How long will it take the sister to make the dress?

15. What is the value per pound of a mixture of coffee composed of 6 pounds at 27 cents and 2 pounds at 19 cents?

16. My clock gains 5 minutes an hour. It is right at noon. What is the correct time when the clock shows 5 o'clock in the afternoon of the same day?

17. If $\frac{2}{3}$ of a pound of cheese costs 2 cents more than $\frac{1}{4}$ of a pound of butter at twice as much per pound, how much is paid for each per pound?

18. For every 2 miles that I can walk, I can go 9 miles on a bicycle. In a journey of 60 miles, I walk 3 times as long as I ride. How many miles do I travel by bicycle? How many miles do I walk?

19. A grocer bought some sweet and some sour apples, 40 bushels in all, for \$18. For the sour ones he paid 50 cents per bushel and for the sweet ones 30 cents per bushel. How many bushels of each kind did he buy?

SOLUTION: — If they had all been sour, they would have cost \$20. This cost is reduced 20 cents by each bushel of sweet apples bought; the total reduction being \$2, there were therefore 10 bushels of sweet apples, and 30 bushels of sour apples. Therefore, etc.

20. A drover bought 20 animals, consisting of sheep and lambs, for all of which he paid \$100. For the sheep he paid \$6 apiece, and for the lambs \$2 apiece. How many of each were there?

21. The time worked by a father and his son, during a certain month, amounted to 30 days, for which their total wages were \$70. How many days did each work if the father received \$3, and the son \$1 per day?

22. A merchant paid \$340 for 60 barrels of flour of two qualities. For the better quality he paid \$6, and for the inferior \$5 per barrel. How many barrels of each quality did he buy?

23. A farmer sold 100 turkeys and chickens for \$68, receiving 80 cents each for the turkeys, and 50 cents each for the chickens. How many of each were there?

24. A man employed a certain number of men at \$2½ per day, and the same number of boys at \$¾ per day. If their daily pay amounted to \$39, how many of each were there?

25. A man agreed to work for 30 days at \$4 per day, but for each day that he was idle he was to forfeit \$2.

At the end of the time he received \$90. How many days did he work?

SUGGESTION. — When he was idle he lost \$6 per day.

26. A man agreed to work 18 days at $\$3\frac{1}{2}$ a day, and to pay $\$1\frac{1}{2}$ for his board for each day that he was idle. At the end of the time he received \$43. How many days did he work?

27. An employer pays his workmen $\$2\frac{1}{2}$ a day. He hires 5 more men and raises the wages of all to \$3. By doing so, his expenses are increased \$25 a day. How many workmen had he at first?

28. A contractor, by discharging 10 of his men, and reducing the wages of the rest from \$3 to $\$2\frac{1}{2}$ a day reduces his expenses \$50 per day. How many men had he at first?

29. A farmer sold an equal quantity of wheat and rye. He received 60 cents a bushel for the wheat, and 40 cents a bushel for the rye. How many bushels of each were there, if the sum received for wheat was \$6 more than the sum received for rye?

30. A lady expended 50¢ more than $\frac{1}{2}$ her money in one store, 50¢ more than $\frac{1}{2}$ the remainder in another store, and then had \$1.50 left. How much had she at first?

SOLUTION: — If at the second store she had expended only $\frac{1}{2}$ the remainder, she would have had \$2 left; hence she had \$4 left at the first store. If at the first store she had expended only $\frac{1}{2}$ her money, she would have had \$4 $\frac{1}{2}$ left; hence she had \$9 at first.

31. A boy lost 5 more than $\frac{1}{2}$ his marbles, and later he lost 5 more than $\frac{1}{2}$ the remainder, and then had 5. How many had he at first?

32. A poulterer sold 12 less than $\frac{1}{3}$ of his chickens, and had 72 left. How many had he at first?

33. A farmer sold 5 bushels more than $\frac{1}{3}$ of his load of potatoes to one man, and 10 bushels more than $\frac{1}{3}$ of the remainder to another man, and then had 8 bushels left. How many bushels had he in the load?

34. A boy gave 3 less than $\frac{1}{3}$ of his marbles to his brother, and 2 less than $\frac{1}{3}$ of the remainder to a playmate, and had 16 left. How many marbles had he at first?

35. I paid my grocer \$20 more than $\frac{2}{5}$ of what I owed him, and still owed him \$40. How much did I owe him at first?

36. A lady paid for a cloak \$20 more than $\frac{2}{3}$ of her money, and had \$80 left. How much did the cloak cost?

37. A girl cut from a piece of ribbon $\frac{1}{3}$ of a yard less than $\frac{3}{8}$ of it, and then had 2 yards left. How much was there at first?

38. After 30 feet had been broken from the top of a flagpole, there remained standing 10 feet more than $\frac{2}{3}$ of the pole. How long was it at first?

39. A boy paid 25 cents less than $\frac{1}{2}$ his money for a pair of shoes, and 25 cents more than $\frac{1}{2}$ the remainder for a hat, and had 75 cents left. How much had he at first?

40. A man paid me \$20 more than $\frac{2}{5}$ of what he owed me. Soon after he paid me $\frac{2}{5}$ of the remainder, but he still owed me \$40. How much did he owe me at first?

41. What is the rate of the current of a river if a man can row down stream 10 miles an hour and up stream 6 miles an hour?

SOLUTION:—Going down stream his rate is increased by the rate of the current; returning, his rate is diminished by the rate of the current. Hence, the rate down exceeds the rate up by twice the rate of the current. Therefore the river runs 2 miles an hour.

42. How fast can a man row in still water, if he can row down stream 12 miles an hour and up stream 6 miles an hour?

43. A boatman whose rate down a river is $1\frac{1}{2}$ times his rate returning made a round trip between two points in $7\frac{1}{2}$ hours. How long was he returning?

44. If a man rides away from home at the rate of 6 miles an hour and returns at the rate of 3 miles an hour, how long will he take to go 1 mile and return?

45. How far in 7 hours can a man travel at the rate of 8 miles an hour, and return at 6 miles an hour?

46. How far down stream may one go at the rate of 10 miles an hour, and return at the rate of 5 miles an hour, so as to be gone 6 hours?

47. A man went away from home on a railroad train at the rate of 20 miles an hour, and drove back at the rate of 10 miles an hour. How far did he go if he was gone 9 hours?

48. If a man's rate in returning from a trip is $\frac{2}{3}$ of his rate going, what is his rate per hour returning if he can go 36 miles and back in 10 hours?

SUGGESTION:—It takes him 4 hours to go and 6 hours to return.

49. A man whose salary is $1\frac{1}{4}$ times his expenses, saves \$3000 in 10 years. What is his salary?

50. A lady paid the same amount of money for each of two pieces of dress goods. How much did she pay for them if they were 10 cents and 15 cents a yard respectively, and there were 20 yards in all?

51. Two pieces of meat weighing together 20 pounds were each sold for the same sum. What was the weight of each piece, if they were worth 12 cents and 18 cents a pound respectively?

52. How far may a man ride in a coach at the rate of $12\frac{1}{2}$ miles per hour and walk back at the rate of $3\frac{1}{8}$ miles per hour, and be gone $9\frac{1}{2}$ hours?

53. A steamer goes down a river at the rate of 12 miles an hour and returns at the rate of 8 miles an hour. How far does it go, if the time going is $2\frac{1}{2}$ hours less than the time returning?

54. A man drove to town at the rate of $8\frac{1}{2}$ miles per hour, attended to business that occupied him $1\frac{3}{8}$ hours, then drove home at the rate of 5 miles per hour, and reached home after an absence of 7 hours. How far from town did he live?

55. A farm-hand agreed to work a year for \$300 and a watch. At the end of 8 months he received as an equitable settlement \$180 and the watch. How much was the watch worth?

SOLUTION:—In 8 months, or $\frac{2}{3}$ of a year, he had earned \$200 and $\frac{2}{3}$ of the value of the watch. Since he received but \$180 and the watch, he allowed \$20 for the other third of its value. Hence its value was \$60. Therefore, etc.

56. A man agreed to work a year for \$400 and a horse. At the end of 9 months he received \$260 and the horse. What was the value of the horse?

57. A father and his son were to receive \$600 for a year's work. At the end of 10 months the son left. At the end of the year the father received only \$575. At what rate per year was each paid?

58. A man agreed to work a year for \$720 and 48 bushels of wheat. At the end of $9\frac{1}{2}$ months he received \$540 and 68 bushels of wheat. How much was the wheat worth per bushel?

59. A man's work for a year was to be paid for with \$800 and 100 bushels of potatoes. At the end of 9 months he got \$620 and 50 bushels of potatoes. What was the value of the potatoes per bushel?

60. A hare is 27 leaps ahead of a hound, and takes 8 leaps while the hound takes 5; but 2 of the hound's leaps are equal to 5 of the hare's. How many leaps must the hound take to catch the hare?

SOLUTION:—If 2 of the hound's leaps are equal to 5 of the hare's, 1 of the hound's leaps equals $\frac{5}{2}$ of the hare's, and 5 of the hound's equal $12\frac{1}{2}$ of the hare's. Then, in taking 5 leaps the hound gains $4\frac{1}{2}$ of the hare's leaps, and to gain 27 the hound must take as many times 5 leaps as $4\frac{1}{2}$ is contained times in 27, or 6 times 5 leaps, which is 30 leaps. Therefore, etc.

61. A is 12 steps ahead of B, and takes 4 steps while B takes 3; but 2 of B's steps are equal to 3 of A's. How many steps must B take to overtake A?

62. A is 8 steps ahead of B, and goes 5 steps to B's 4; but 3 of B's are equal to 4 of A's. How many steps must B take to overtake A?

63. A thief is 20 steps ahead of an officer, and takes 6 steps while the officer takes 5; but 3 of the officer's steps are equal to 4 of the thief's. In how many steps can the officer catch him?

64. If 3 men and 4 boys earn \$13 in a day, and 4 men and 3 boys earn \$15 in a day, what is the daily pay of a man and of a boy?

SOLUTION:—From the first statement in the problem it is evident that 12 men and 16 boys can earn \$52 in a day; from the second, that 12 men and 9 boys can earn \$45 in a day. Hence, 7 boys earn \$7, or \$1 each per day. If 3 men with 4 boys at \$1 per day earn \$13, 3 men earn \$9, or each man earns \$3 per day. Therefore, etc.

65. If 2 bushels of onions and 3 bushels of potatoes cost \$12, and if 3 bushels of onions and 4 bushels of potatoes cost \$17, how much does each cost per bushel?

66. If $\frac{1}{2}$ of A's weekly wages and all of B's amount to \$17, and if all of A's and $\frac{1}{2}$ of B's amount to \$16, how much does each get per week?

67. A boy works 5 days, and his sister works 4 days, and together they earn \$6. How much does each earn per day, if together they earn \$1.30 a day?

68. At what time between 3 and 4 o'clock are the hour and the minute hands of a clock together?

SOLUTION:—When it is 3 o'clock the hour and minute hands are 15 minute spaces apart, and the minute hand must gain 15 minute spaces to overtake the hour hand. The minute hand gains on the hour hand 11 spaces in every 12 passed over, hence to gain 1 space it must move $\frac{11}{12}$ spaces, and to gain 15 spaces it must pass over 15 times $\frac{11}{12}$ spaces, or $16\frac{5}{12}$ spaces. Hence they are together at $16\frac{5}{12}$ minutes after 3.

69. At what time between 1 and 2 o'clock are the hands of a clock together?

70. Between 4 and 5 o'clock the hands of a clock are together. What time is it?

71. At 4 o'clock the minute hand is 20 minute spaces behind the hour hand. When will it be 20 minute spaces ahead of the hour hand?

72. At what time after 8 o'clock will the minute and hour hands of a clock first be together?

73. A and B walk in the same direction around a track 100 rods in circumference, A going 5 rods while B goes 3 rods. When A starts B is 20 rods ahead. How far from the starting point will A overtake B?

74. At what time between 3 and 4 o'clock are the hands opposite?

75. What time is it if $\frac{1}{3}$ of the time past noon is equal to $\frac{1}{5}$ of the time to midnight?

SOLUTION :— If $\frac{1}{3}$ of the time past noon is equal to $\frac{1}{5}$ of the time to midnight, the time past noon is equal to $\frac{3}{5}$ of the time to midnight, and $\frac{3}{5}$ of the time to midnight equals the time from noon to midnight, which is 12 hours; consequently $\frac{1}{3}$ of the time to midnight is $\frac{3}{5}$ hours, and the time to midnight is $1\frac{1}{2}$ hours, equal to $7\frac{1}{2}$ hours. Therefore the time past noon equals 12 hours less $7\frac{1}{2}$ hours, or $4\frac{1}{2}$ hours, hence the time is half past 4 o'clock.

76. If $\frac{1}{2}$ of the time past noon is equal to $\frac{1}{3}$ of the time to midnight, what time is it?

77. What time is it if $\frac{1}{4}$ of the time past noon is equal to $\frac{1}{6}$ of the time to midnight?

78. What time is it if $\frac{1}{2}$ of the time since 9 o'clock in the morning is equal to $\frac{1}{3}$ of the time to midnight?

79. I have horses and cows to the number of 60, 20 of which are cows. How many more horses must I buy so that there may be 5 horses to 2 cows?

SOLUTION: — There are 10 times 2 cows, and to keep the rate of 5 horses to 2 cows there should be 10 times 5 horses. But there are only 40; consequently 10 more horses should be bought.

80. If 100 pounds of sea water contain 5 pounds of salt, how much fresh water must be added that 50 pounds of the new mixture shall contain 2 pounds of salt?

81. In 100 drops of prussic acid as prepared for medical use, there are only 2 drops of the pure acid. How many drops of the mixture are there in a dose containing $\frac{1}{10}$ of a drop of the pure acid?

82. In 160 pounds of a certain brand of solder there are 60 pounds of tin, and the rest is lead. How much tin must be added that the mixture may be $\frac{4}{5}$ tin?

SUGGESTION: — The new mixture will contain 4 pounds of tin to 5 pounds of lead.

83. In a class of 72 pupils 30 of them are boys. How many girls must leave so that there may be 4 girls to 5 boys?

84. A farmer has 120 sheep and cows, the cows being $\frac{5}{7}$ as many as the sheep. How many sheep must he buy that he may have 9 sheep to 5 cows?

85. In a mixture of 60 ounces of silver and copper there are 4 ounces of silver. How much copper must be added that 10 ounces of the new mixture shall contain $\frac{2}{3}$ of an ounce of silver?

86. A man spends \$160 for an equal number of sheep and lambs, paying \$5. each for the sheep and \$3 each for the lambs. How many lambs must he sell that there shall be $\frac{1}{2}$ as many lambs as sheep?

87. A man having \$150 in a bank drew out as much as he had in his purse, and then the two amounts were the same. How much did he draw out?

88. A has \$140 and loans B $\frac{2}{3}$ as much as he already has, and then each has the same sum. How much had B at first?

89. A has a farm of 250 acres and sells B $\frac{2}{5}$ as many acres as B already has. B then has $\frac{2}{3}$ as much as A. How much has each after the sale?

90. Anna is 21 years old, and her niece is 9. How long is it since Anna was 3 times as old as her niece?

SOLUTION:—When Anna is 3 times as old as her niece, the difference between their ages is twice the age of the niece. But this difference, 12 years, is always the same. Therefore twice the niece's age at the required time was 12 years; consequently her age 3 years ago was 6 years.

91. John is 8 years old, and his father 32. How many years old will each be when John's age is $\frac{1}{3}$ of his father's age?

92. My age is 60 years, and that of my oldest son is 30 years. How long ago was I 3 times as old as he?

93. A steamer goes 5 miles down stream in the same time that it goes 3 miles up stream; but if its rate each way is diminished 4 miles an hour, its rate down stream will be twice its rate up stream. How fast does it go in each direction?

94. At 3 o'clock the minute hand is 15 minute spaces behind the hour hand. How long afterward will it be 15 minute spaces ahead of the hour hand?

95. If $2\frac{3}{4}$ quarts of vinegar cost 19 cents, how much will $2\frac{3}{4}$ gallons cost?

96. If $1\frac{1}{4}$ bushels of cranberries cost \$1.68, how much will $1\frac{1}{4}$ pecks cost?

97. The labor of 4 boys is worth as much as that of 2 men. When a man can earn \$3 a day, how much can 3 boys and 4 men earn in 6 days?

98. The head of a fish is $\frac{2}{3}$ as long as the tail, and the body is 3 times as long as the head and tail together. How long is each, if the fish is 56 inches in length?

99. When wheat flour is worth 3 times as much as rye flour, a baker gets 10 cents for a loaf of bread $\frac{1}{4}$ rye. How much should he get when a loaf of the same weight is half rye?

100. Two boys on a fishing excursion take 8 sandwiches for their lunch, one furnishing 5 and the other 3. A third boy joins them, paying 16 cents for an equal share of the lunch. How much of the money should each of the two boys have?

101. A's money is $1\frac{1}{2}$ times B's, and C has $\frac{4}{5}$ as much as A and B together. How much has each, if all their money is \$180?

102. When $\frac{3}{4}$ of the time past noon is equal to the time to midnight, what time is it?

103. After 5 men have worked 6 days at a piece of work, they are joined by 7 other men, with whose help

the work is finished in 5 days more. How long would it have taken the 5 men to do the entire work?

104. A man bought some sheep at \$5 each. Reserving 10, he sold the remainder at a gain of \$2 per head, and received for them \$10 more than they all cost. How many sheep were there?

105. A and B agreed to plow a field for \$120. A plowed $\frac{1}{3}$ of the field and 5 acres besides and received \$50. How many acres were there?

106. A and B agree to cut 94 cords of wood. How many cords does each cut, if $\frac{1}{2}$ of what A cuts is 2 cords more than $\frac{1}{5}$ of what B cuts?

107. Two men hired a pasture for \$42. A put in 5 horses for 4 weeks, and B put in 12 horses for 3 weeks. How much should each pay?

108. If a man can do $\frac{2}{3}$ of a piece of work in 18 days, in what time can 3 men do the entire work?

109. A and B can do a piece of work in 3 days; A and C, in 4 days; B and C, in 6 days. How long will it take each alone, and how long all together to do it?

110. The interest on a certain principal for 5 years, at 4%, is a sum such that, in 5 years, at 6% the interest on it will be \$150. Find the original principal.

111. A is 50 rods ahead of B, and goes 3 rods while B goes 5. How far must B go to overtake A?

112. An island is 72 miles in circumference. A, who goes 3 miles an hour, and B, who goes 4 miles an hour, start from the same point and travel in the same direction. How far will each travel before they are together?

113. George has 70 cents more than Charles, and $\frac{2}{3}$ of George's money is equal to $\frac{3}{4}$ of Charles's money. How much has each?

114. Apples bought at 2 cents for 3 are sold at 3 cents for 2. What is the gain per cent?

115. A rope 33 ft. long is cut so that $\frac{3}{8}$ of one piece is 6 ft. less than $\frac{2}{3}$ of the other. How long is each piece?

116. If 3 men and 5 boys earn \$110 in a week, and 5 men and 3 boys \$130 in a week, what are the wages per week of a man and of a boy?

117. The interest for 5 years, at 4%, of A's and B's money together is \$280. How much has each, if $\frac{2}{3}$ of A's money is equal to $\frac{1}{2}$ of B's?

118. A, B, and C together did a piece of work for \$84. They agreed to divide the money so that A should have \$5 as often as B had \$4 and C \$3. How much did each get?

119. How much must be paid for 12 melons if 5 melons are worth 12 peaches, and 5 peaches are worth 25 cents?

120. A steamer goes 12 miles an hour down stream and 10 miles an hour up stream. How far down stream can it go and be back 10 hours from the time it left?

121. A's money and $\frac{3}{4}$ of B's amount to \$8000. How much has each if $\frac{2}{5}$ of A's is equal to $\frac{1}{2}$ of B's?

122. How far may one go in a car that runs 12 miles per hour, that he may walk back at the rate of 3 miles per hour, and be gone only 10 hours?

123. If sea water contains 5% of salt, how many pounds of fresh water must be added to 100 pounds of sea water, so that the mixture may contain 4% of salt?

124. I paid a debt of $\$4\frac{2}{3}$ with dimes and 25-cent pieces. How many of each kind of coin were there, if $\frac{4}{5}$ the number of dimes was equal to $\frac{2}{3}$ the number of 25-cent pieces?

125. In a mixture of silver and copper weighing 80 ounces, there are 8 ounces of copper. How many ounces of silver must be added that the mixture may be 5% copper?

126. A tree 148 feet long was broken into two pieces such that $\frac{2}{3}$ of the shorter piece was 10 feet shorter than $\frac{1}{3}$ of the longer. How long were the pieces?

127. If I pay my grocer's bill and half my butcher's bill, it will take \$60; if I pay half my grocer's bill and half my butcher's bill, it will take \$48. How much do I owe each?

128. I gain 20% after giving a discount of 25% and 20% on a piano. How much did it cost, if I sold it for \$360?

129. A man earns \$5 per day, and pays \$1 $\frac{1}{2}$ per day for his board. At the end of 60 days he has saved \$160. How many days has he been idle?

130. A, B, and C can do a piece of work in 1 $\frac{2}{3}$ days; A and B can do it in 2 $\frac{1}{2}$ days; and B can do it in 5 days. How long will it take each to do it?

131. Two men or 5 boys can do a piece of work in 12 days. How long will it take 4 men and 2 boys to do it?

132. One half of A's money plus $\frac{1}{3}$ of B's = \$21; and $\frac{1}{3}$ of A's plus $\frac{1}{2}$ of B's = \$24. How much has each?

133. Arthur and Louis together have 80 marbles; $\frac{2}{3}$ of Arthur's marbles increased by 8 are equal to $\frac{2}{3}$ the number Louis has. How many has each?

134. Divide 100 into two parts, such that 7 times the first part shall be equal to 3 times the second part.

135. When I divide a certain number by 8, the remainder is 3; what is the number if the quotient is twice the remainder?

136. A boy bought 65 oranges and lemons. How many of each were there, if 5 times the number of oranges was equal to $1\frac{1}{2}$ times the number of lemons?

137. The amount of a certain principal for a certain time at 4% is \$480, and at 7% it is \$540. Find the principal and the time.

138. By advancing the price of a piano \$22, the gain is increased $2\frac{3}{4}\%$. Find the cost of the piano.

139. John is 22 years old, and his father 46. How long ago was John's age $\frac{1}{3}$ of his father's age?

140. A certain number of oxen cost \$1800. A later purchase of 5 oxen at \$10 less each made the entire cost \$2050. How many were bought the first time?

141. The sum of two numbers is 40, and their difference multiplied by itself is 100. What are the numbers?

142. A has $2\frac{1}{2}$ times as much money as B, but after B has borrowed 30 cents from A, they have equal amounts. How much had each at first?

143. A father takes 3 steps while his son takes 5, but 2 of the father's steps are equal to 3 of the son's. How many steps will the son require to overtake the father, who is 24 steps ahead?

144. Divide \$66 among A, B, and C, so that A shall have 40 cents as often as B has 50 cents and C 75 cents.

145. A man sells two stoves at \$40 each, gaining $33\frac{1}{3}\%$ on one, and losing $33\frac{1}{3}\%$ on the other. What per cent does he gain or lose on both?

146. The head of a fish is 6 inches long; the tail is twice as long as the head, and the body is as long as the head and tail together. How long is the fish?

147. A clock gains 10 seconds in 5 minutes. On Monday at noon it is set right. What is the correct time when the clock indicates noon on Tuesday?

148. Three pedestrians whose rates are as the numbers 3, 4, and 5 start from the same point to walk in the same direction around a circular track 120 yards in circumference. They are together at the start; when are they next together, and how far has each gone?

149. A tree in falling is broken into 3 pieces. The lower piece is $\frac{3}{8}$ as long as the middle piece, and $\frac{3}{4}$ of the length of the top is $1\frac{1}{2}$ times the length of the middle. How long is each piece if the tree is 170 feet high?

150. What part of 10 is 80% of $8\frac{1}{3}$? What % of 10 is 80% of $7\frac{1}{2}$?

151. A cistern can be filled by one pipe in 20 minutes, by another in 30 minutes, and a third pipe can empty

it in 15 minutes. If it is empty, and all run together, in how many minutes will it be filled?

152. If 20% of the cost of a horse is equal to 30% of the cost of a wagon, what must be the selling price of each to gain 25% if the horse cost \$100 more than the wagon?

153. By raising the price of flour 50 cents a barrel, a grocer increases his gain from 20% to 25%. What does the flour cost him, and what does he get for it?

154. A man bought 40 yards of silk at \$4 a yard. After 10% of it was ruined by accident he sold the remainder so as to gain $12\frac{1}{2}\%$ on the cost of the whole. What was the selling price per yard?

155. Mary spent 5 cents more than $\frac{1}{3}$ of her money for ribbons; 5 cents more than $\frac{1}{3}$ the remainder for a doll; 5 cents more than $\frac{1}{3}$ of what still remained for a book. She then had 25 cents left. How much had she at first?

156. If the shorter piece of a broken pole that was 90 feet long is diminished by 6 feet, its length will be $\frac{1}{2}$ that of the longer piece. How long is each piece?

157. If a baker charges 8 cents for a 5-ounce loaf, how much should he charge for an 8-ounce loaf when flour is $1\frac{1}{4}$ times as dear?

158. Twelve men charter a car to go on an excursion. By taking in 8 more, the expense is diminished \$2 for each man. How much is paid for the car?

159. Twenty-five men engage a dinner, but when the dinner is served, 5 of them are absent, by which the expense is increased \$1 for each man. How much do they pay in all?

160. The distance around a rectangular field whose length is to its breadth as 5 to 3 is 640 rods. How many acres are there in the field?

161. A loaned B \$800 for $4\frac{1}{2}$ months. How long should B lend A \$600 to discharge the obligation?

162. A train runs 72 miles in 2 hours and 40 minutes. What is the rate per hour?

163. In a certain school there are 100 pupils, 40 of whom are girls. How many girls must leave the school so that 80% of the pupils may be boys?

164. If I buy new oats for 30 cents per bushel, and they shrink 10% in drying, how much per bushel should I charge for them to make a profit of 20%?

165. A man gave money to some children, giving 10 cents to each, and had 10 cents left. If he had given 12 cents to each, he would have lacked 8 cents of having enough money. How much money had he, and how many children were there?

166. A man paid a debt of \$6.20 with 32 coins, viz. quarters and dimes. The quarters were $1\frac{3}{4}$ times the dimes in number. How many of each were there?

167. A man receives \$3 a day and his board when he works, but when he is idle he pays \$1 $\frac{1}{2}$ a day for his board. At the end of 40 days he receives \$75. How many days has he been idle?

168. A and B can do a piece of work in 6 days; A and C can do it in 8 days; B and C can do it in 12 days. How long will it take the three together to do it, and how long each one separately?

169. A man burns $3\frac{3}{4}$ tons of coal in $2\frac{1}{4}$ months. How much at \$5 per ton will his coal cost for a year at that rate?

170. If the square of a certain number is increased by 25 the square root of the number is 13. What is the number?

171. A man pays \$264 for a number of sheep at \$8 each, and $2\frac{1}{2}$ times as many hogs at \$10 each. How many of each does he buy?

172. If $\frac{3}{4}$ of A's money increased by \$10 is equal to $\frac{3}{4}$ of B's increased by \$18, how much has each, if they have together \$182?

173. A man paid \$120 for some sheep and lambs. By selling them all at \$ $2\frac{1}{2}$ each, he gained \$5. How many of each were there, if the lambs were $1\frac{1}{2}$ times as many as the sheep?

174. When raspberries are worth $\frac{3}{4}$ as much as strawberries, a quart and a pint of each cost 42 cents. How much is each per quart?

175. Two children, at the ages of 13 and 15 years respectively, inherit \$2700, which is to be divided so that the shares of both put at simple interest at 5% will amount to equal sums when each is 21 years old. What is the share of each?

176. If I pay 4 cents a pound less for meat, 12 pounds can be bought for what 8 pounds would have cost. What is the higher price?

177. A boy leaves home on his bicycle, and travels at the rate of 8 miles per hour. His bicycle breaks

down, and he walks home at the rate of 3 miles per hour. How far from home was he, if he was absent 11 hours?

178. A certain principal at 5% simple interest yields, in a certain time, interest equal to 5 times the principal. Find the time.

179. If the interest on a certain sum of money for 8 years at 5% is placed at interest for the same time, and at the same rate, it will yield \$40 interest. What is the first principal?

180. If the sides of a square are increased by 4 feet, its area will be 80 square feet greater. Find the side of the square.

181. A drover bought some sheep at \$5 each. After 4 of them had died, he sold the remainder at \$6 per head, and received for them what all the sheep cost. How many did he buy?

182. A man who can walk 3 miles an hour up hill, and 4 miles an hour down hill, requires 17 hours to make a journey of 60 miles. How much of the road is up hill, and how much down hill?

183. Disregarding the resistance of the air, an object falls $16\frac{1}{2}$ feet the first second, 3 times that distance the second second, 5 times that distance the third second, and so on. How far does it fall in 2 seconds? in 3 seconds? in 5 seconds? in 6 seconds?

184. How much farther does a body fall the 5th second than the 3d? the 7th than the 4th? How far will it fall in 10 seconds?

185. A merchant bought a certain number of yards of cloth at \$1 for 5 yards, and the same number of yards at \$1 for 4 yards. He sold it all at the rate of \$2 for 9 yards, and lost \$1. How many yards did he buy?

186. A customer bought what he supposed was \$45 worth of sugar, but a false weight having been used he got only \$40 worth. How many ounces were given him for a pound?

187. If I sell one of my two houses for \$4500 and the other for \$1860, I will gain 6% on the cost of both; but if I sell the dearer house at \$4000 and the other at cost, I will lose 5%. What was the cost of each house?

188. A farmer has 434 bushels of wheat in 3 bins. Two thirds of the number of bushels in the first bin equals $\frac{2}{3}$ of the number in the second, and $\frac{2}{3}$ of the number in the second equals $\frac{2}{3}$ the number in the third. How many bushels of wheat are there in each bin?

189. A commission merchant who charged 5%, both for selling and buying, received \$1500 worth of produce and \$675 in cash, with instructions to sell the produce and to invest the whole in flour at \$5 per barrel. How many barrels of flour were purchased?

190. A merchant's expenses during a certain year were $33\frac{1}{3}\%$ of the gross gain on his sales. His goods were marked 30% above cost. At the beginning of the next year he advanced the price of his goods 10% of the marked price, and during the year cut down his expenses 10%. What per cent did he gain during the second year?

TABLES OF DENOMINATE NUMBERS

68.

LINEAR MEASURE

TABLE

12 Inches (in.)	= 1 Foot	ft.
3 Feet	= 1 Yard	yd.
5½ Yards or 16½ ft.	= 1 Rod	rd.
320 Rods	= 1 Mile	mi.

The following are also used :

3 Barleycorns	= 1 Inch.	Used by shoemakers.
4 Inches	= 1 Hand.	Used to measure the height of horses.
6 Feet	= 1 Fathom.	Used to measure depths at sea.
3 Feet	= 1 Pace.	} Used in pacing distances.
5 Paces	= 1 Rod.	
8 Furlongs	= 1 Mile.	

SQUARE MEASURE

TABLE

144 Square Inches (sq. in.)	= 1 Square Foot	sq. ft.
9 Square Feet	= 1 Square Yard	sq. yd.
30¼ Square Yards	= 1 Square Rod	sq. rd.
160 Square Rods	= 1 Acre	A.
640 Acres	= 1 Square Mile	sq. mi.

CUBIC MEASURE

TABLE

1728 Cubic Inches (cu. in.)	= 1 Cubic Foot . . .	cu. ft.
27 Cubic Feet	= 1 Cubic Yard . . .	cu. yd.
128 Cubic Feet	= 1 Cord	C.

A cord of wood or stone is a pile 8 ft. long, 4 ft. wide, and 4 ft. high.

LIQUID MEASURE,

TABLE

4 Gills (gi.)	= 1 Pint	pt.
2 Pints	= 1 Quart	qt.
4 Quarts	= 1 Gallon	gal.

DRY MEASURE

TABLE

2 Pints (pt.)	= 1 Quart	qt.
8 Quarts	= 1 Peck	pk.
4 Pecks	= 1 Bushel	bu.

AVOIRDUPOIS WEIGHT

TABLE

16 Ounces (oz.)	= 1 Pound	lb.
100 Pounds	= 1 Hundredweight . .	cwt.
20 Hundredweight	= 1 Ton	T.

TROY WEIGHT

TABLE

24 Grains (gr.)	= 1 Pennyweight . . .	pwt.
20 Pennyweights	= 1 Ounce	oz.
12 Ounces	= 1 Pound	lb.

TIME

TABLE

60 Seconds (sec.)	= 1 Minute . . .	min.
60 Minutes	= 1 Hour . . .	hr.
24 Hours	= 1 Day . . .	da.
7 Days	= 1 Week . . .	wk.
365 Days	= 1 Year . . .	yr.
366 Days	= 1 Leap Year . . .	yr.
100 Years	= 1 Century . . .	cen.

Centennial years exactly divisible by 400, and other years exactly divisible by 4, are Leap Years.

The common year contains 52 weeks and 1 day, the leap year 52 weeks and 2 days. Hence, commonly, each year begins one day later in the week than did the preceding year, but the year succeeding leap year begins *two* days later.

The names of the months, their abbreviations, and the number of days in each, are as follows:

January, 31 da. . .	Jan.	July, 31 da. . .	July.
February, 28 or 29 da. . .	Feb.	August, 31 da. . .	Aug.
March, 31 da. . .	Mar.	September, 30 da. . .	Sept.
April, 30 da. . .	Apr.	October, 31 da. . .	Oct.
May, 31 da. . .	May.	November, 30 da. . .	Nov.
June, 30 da. . .	June.	December, 31 da. . .	Dec.

UNITED STATES MONEY

TABLE

10 Mills (m.) = 1 Cent . . .	¢	10 Dimes = 1 Dollar . . .	\$
10 Cents = 1 Dime . . .	d.	10 Dollars = 1 Eagle . . .	E.

ENGLISH OR STERLING MONEY

TABLE

4 Farthings (far.)	=	1 Penny	<i>d.</i>
12 Pence	=	1 Shilling	<i>s.</i>
20 Shillings	=	$\left\{ \begin{array}{l} 1 \text{ Pound, or} \\ 1 \text{ Sovereign} \end{array} \right\}$. . . <i>£</i>

COUNTING

TABLE

12 Things	=	1 Dozen	doz.
12 Dozen	=	1 Gross	gr.
12 Gross	=	1 Great Gross . . .	G. gr.
20 Things	=	1 Score.	

STATIONERY

TABLE

24 Sheets = 1 Quire.		2 Reams = 1 Bundle.
20 Quires = 1 Ream.		5 Bundles = 1 Bale.



To avoid fine, this book should be returned on
or before the date last stamped below

10M-6-40

--	--	--

11

Wilne, William J.
Mental arithmetic.

613423

[illegible]

NAME _____ DATE _____

LIBRARY, SCHOOL OF EDUCATION, STANFORD

61342

613423

